

TROPICAL DISEASES BULLETIN

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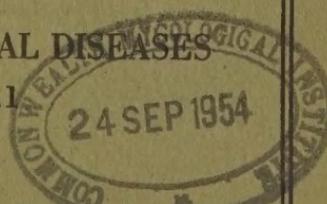
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RECOMMENDATIONS ON THE USE OF ANTIMALARIAL DRUGS

Prepared by

The Malaria Sub-Committee of the Colonial Medical Research Committee

[The Malaria Sub-Committee of the Colonial Medical Research Committee has compiled the following recommendations on the use of antimalarial drugs. They are reprinted in full for the information of practitioners at home and abroad who may be required to treat malaria. Copies of these recommendations, in pamphlet form, may be obtained from the Secretary, Malaria Sub-Committee of the Colonial Medical Research Committee, National Institute for Medical Research, The Ridgeway, Mill Hill, London, N.W.7.]

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In 1949 the Colonial Medical Research Committee drew up recommendations on the use of Paludrine (proguanil) in suppression and treatment of malaria; these were tentative on the basis of knowledge available at the time and were stated to be subject to revision in the light of future experience and experiment. The additional experience since gained makes it advisable to revise the recommendations and also to indicate the suitable methods of use of the different antimalarials now available. The revision is specially necessary in view of the further evidence which has been obtained that (a) some drugs which are effective in suppression of malaria are unsuitable for use in the treatment of the overt attack owing to their

slow schizontocidal action, and that (b) the unsuitable use of certain anti-malarials for suppression or for treatment of the overt attack may result in the development of drug-resistant strains of the malaria parasites.

Actions and uses of antimalarial drugs

No single drug at present available is effective against all phases of the cycle of development of the malaria parasite; the preparation to be used for a particular purpose will be that active against the appropriate phase. The purposes for which antimalarial drugs are used are:

- A. For causal prophylaxis or suppression (destruction of the parasite in the pre-erythrocytic phase or in the asexual erythrocytic phase).
- B. For treatment of the overt malarial attack (destruction of the asexual parasites in the blood stream).
- C. For radical cure of vivax and malariae (quartan) malaria (destruction of the late exo-erythrocytic forms).
- D. For prevention of transmission (destruction of the gametocytes in the peripheral circulation or interruption of sporogony in the mosquito).

A. CAUSAL PROPHYLAXIS OR SUPPRESSION

The onset of a clinical attack of malaria can be prevented either by a drug acting on the pre-erythrocytic forms of the parasite (causal prophylaxis) or by one acting on the asexual erythrocytic forms (suppression).

(1) Causal prophylaxis

The 8-aminoquinolines (pamaquin, primaquine) show such action but the margin between the prophylactic and the toxic dose is too narrow to permit of their use for this purpose. The only drugs which can achieve this effect with safety are the biguanides (proguanil) and the diaminopyrimidines (pyrimethamine): their action in this respect is definite as far as falciparum infection is concerned. Since, however, they act also on the asexual erythrocytic forms of all species of human plasmodia their use as protective drugs is by no means confined to falciparum infections.

(2) Suppression

Drugs used for suppression show the following characteristics, advantages and limitations:—

Quinine, formerly widely used for this purpose, has several disadvantages. For the effective suppression of falciparum malaria, it may have to be taken in doses as high as 10 grains daily, and in New Guinea even this dosage has proved insufficient. Apart from the unpleasant side effects which may arise from prolonged administration of this amount of quinine, its association with the precipitation of blackwater fever makes it unsuitable for use as a suppressant in areas where falciparum infections are prevalent. *Mepacrine* is a very effective suppressant of all forms of malaria, but has certain disadvantages which detract from its usefulness. When taken over long periods it sometimes produces skin lesions, the most common of these being a lichenoid dermatitis. Yellow discolouration of the skin, a usual feature, is a further disadvantage.

Chloroquine and *amodiaquine* are probably even more powerful suppressants than mepacrine. Their action resembles that of mepacrine, but they are on the whole less toxic and they do not tint the skin.

Proguanil and *pyrimethamine*, as well as being causal prophylactics in falciparum infections, are effective suppressants of all forms of malaria.

They also have the advantage of preventing the completion of sporogony and of being considerably less costly than the 4-aminoquinolines. There is, however, a possibility that drug resistance may appear in areas where either of these compounds is in common use, particularly if they are employed indiscriminately as therapeutic agents, though proven examples of this are very rare. Cross resistance has been shown to exist between proguanil and pyrimethamine, so that if resistance to either of them becomes apparent a switch-over to chloroquine, amodiaquine or mepacrine is indicated; or, if none of these is available, to quinine.

B. TREATMENT OF THE OVERT ATTACK *

(1) *In non-immune subjects*

For this class of patient it is necessary to employ one of the more powerful schizontocidal drugs, such as chloroquine, amodiaquine, mepacrine or quinine.

Quinine has the disadvantage of its association with the precipitation of blackwater fever, and is comparatively ineffective against certain strains of malaria parasites. It cannot be relied upon to effect radical cure of infections with some strains of *P. falciparum*.

Mepacrine has a rapid action in all forms of malaria, but minor toxic manifestations and occasional psychoses of a more serious nature are definite drawbacks. The yellow tinting of the skin sometimes produced is also undesirable.

Chloroquine and *amodiaquine* are probably the most effective agents for terminating the clinical attack, and toxic manifestations of a serious nature are rare with either drug:

Neither proguanil nor pyrimethamine is sufficiently rapid in action to warrant its use in the treatment of malaria in non-immune subjects.

(2) *In subjects partially immune* †

For the dispensary treatment of partially immune populations of malarious countries, a single-dose treatment with chloroquine, proguanil, amodiaquine or mepacrine has proved effective. Good results have also been reported with pyrimethamine given as a single dose. In view of the possibility of drug resistance arising with both proguanil and pyrimethamine it seems wiser to reserve these drugs exclusively for prophylaxis and suppression and to use for therapeutic purposes chloroquine, amodiaquine, mepacrine or quinine. If quinine is used, treatment for 2 to 5 days is usually necessary.

(3) *For emergency treatment*

In the treatment of pernicious forms of malaria, whether cerebral, algid or gastro-intestinal, oral administration of drugs is seldom practicable, and since prompt action is necessary to save the patient's life, antimalarial drugs must be given parenterally in such cases. Quinine dihydrochloride intravenously has been a standard and successful treatment for many years. Mepacrine methane sulphonate may be given intramuscularly as an alternative. Recent work indicates that chloroquine is equally successful when given intramuscularly or intravenously. The intramuscular injection of quinine, still widely practised in many countries, has the disadvantage that

* As a general principle, in areas where drug prophylaxis or suppression is in operation, a different drug should be used for treatment of the clinical attack.

† i.e. The indigenous inhabitants of malarious regions.

it causes necrosis and may produce abscess. Whatever is used, as soon as the patient is able to take drugs by the mouth, all further medication should be by this route.

C. RADICAL CURE

(i) *Vivax and malariae (quartan) malaria*

The only drugs which are effective against the late exo-erythrocytic forms of the parasite are the 8-aminoquinolines. Pamaquin has been used for this purpose for many years but recently primaquine has been shown by American workers to be more effective and less toxic. If an overt attack is in progress standard treatment with a schizontocidal drug should precede or accompany the course of pamaquin or primaquine.* This combined treatment is also applicable when falciparum malaria occurs in association with vivax or malariae (quartan) infections. Treatment of chronic relapsing malariae (quartan) infections is the same as for vivax cases.

(ii) *Ovale malaria*

Many infections with *P. ovale* end in spontaneous recovery. Treatment with 8-aminoquinolines is not usually necessary.

(iii) *Falciparum malaria*

There is convincing evidence against the existence of late exo-erythrocytic forms of *P. falciparum*. Any relapses that may occur are due to the persistence of erythrocytic forms. Any of the more powerful schizontocides mentioned above will usually effect radical cure.

D. PREVENTION OF TRANSMISSION

The 8-aminoquinolines are the only drugs which are able to destroy the sexual forms of *P. falciparum* in the peripheral blood. Proguanil and pyrimethamine have no demonstrable action on the gametocytes in the blood, but both have the property of preventing them from undergoing full development in the mosquito, so that mosquitoes feeding on patients taking either of these drugs are unable to transmit the disease to others.

Suggested dosage

(Unless otherwise stated the dosage suggested is for adults. That for children should be calculated according to age and weight.)

A. CAUSAL PROPHYLAXIS AND SUPPRESSION

(i) *Proguanil monohydrochloride* †

Adults—100 mgm. daily.

Children—0 to 5 years 25 mgm. daily.

6 to 12 years 50 mgm. daily.

Adults partially immune—300 mgm. once weekly.

* Mepacrine should not be given concurrently with any of the 8-aminoquinoline drugs.

† In parts of Africa this scale of dosage for proguanil has been found insufficient; in Nigeria, for example, the following scale has been recommended:

Adults—100 to 200 mgm. daily.

Children—0 to 1 year 50 mgm. three to six times weekly.

1 to 3 years 50 mgm. daily.

Over 3 years 100 mgm. daily.

(ii) *Pyrimethamine*

Adults—25 mgm. weekly.

Children—0 to 5 years 6·25 mgm. weekly.

6 to 12 years 12·5 mgm. weekly.

(iii) *Chloroquine diphosphate or sulphate*

Adults—300 mgm. base weekly.

(iv) *Amodiaquine dihydrochloride dihydrate*

Adults—400 mgm. base weekly.

(v) *Mepacrine hydrochloride*

Adults—100 mgm. daily.

Adults partially immune—300 mgm. once weekly.

(vi) *Quinine sulphate or dihydrochloride*

Adults—650 mgm. (10 grains) daily.

Recommended only when none of the drugs listed above is available.

No suppressive regimen will be effective unless followed with the utmost regularity.

In the case of persons who have been resident in an endemic area for some time, or who have otherwise been exposed to malaria infection, a full therapeutic course should be taken before entering on a suppressive regimen, if there are grounds for suspecting active or latent falciparum malaria.

If mepacrine is the drug employed, administration should be commenced 14 days before entering an endemic area. Administration of the other drugs should be commenced immediately before entry.

If the drug used is not affording protection in the dosage recommended, when taken regularly, a change should be made to another suppressive.

The prophylactic regimen should be continued for one month after leaving an endemic area.

B. TREATMENT OF THE OVERT ATTACK

(1) *For non-immune subjects*

- (i) *Chloroquine diphosphate or sulphate* 600 mgm. base, followed in 6 hours by 300 mgm. base, then 300 mgm. base daily for 2 days.
- (ii) *Amodiaquine dihydrochloride dihydrate* 600 mgm. base followed by 400 mgm. base daily for 2 days.
- (iii) *Mepacrine hydrochloride* 300 mgm. three times on first day, 300 mgm. twice on second day, then 100 mgm. three times daily for 5 days.
- (iv) *Quinine sulphate or dihydrochloride* 650 mgm. (10 grains) three times daily for 7 to 10 days.

(2) *FOR SUBJECTS PARTIALLY IMMUNE*

- (i) *Chloroquine diphosphate or sulphate* 600 mgm. base in single dose.
- (ii) *Amodiaquine dihydrochloride dihydrate* 600 mgm. base in single dose.
- (iii) *Mepacrine hydrochloride* 300 to 500 mgm. in single dose.
- (iv) *Quinine sulphate or dihydrochloride* 1,000 to 1,500 mgm. (15 to 20 grains) daily for 2 to 5 days.

(3) *Emergency treatment*

- (i) *Quinine dihydrochloride* 650 mgm. (10 grains) in sterile normal saline injected intravenously and repeated in 6 hours if necessary. Not more

than three injections should be given within 24 hours. Distilled water can be used as a solvent if the volume does not exceed 10 to 15 ml. It is imperative that quinine be injected slowly, at a rate not exceeding 65 mgm. (one grain) per minute.

- (ii) *Mepacrine methane sulphonate* 375 mgm. or *mepacrine hydrochloride* 300 mgm. intramuscularly, repeated in 6 hours if necessary.
- (iii) *Chloroquine salts*. The *hydrochloride* is given intramuscularly in dosage of 200 to 300 mgm. of base (supplied in ampoules in aqueous solution), repeated in 6 hours if necessary, and intravenously, 400 mgm. of base in 500 ml. normal saline by intravenous drip over a period of 1 hour. The *sulphate* supplied in 5 cc. ampoules (40 mgm. base to 1 cc.) is given in dosage of 200 mgm. base intravenously, repeated after 8 hours if necessary.

C. RADICAL CURE OF VIVAX AND MALARIAE (QUARTAN) MALARIA

- (i) *Pamaquin naphthoate* 8-10 mgm. base three times daily for 10 to 14 days.
- (ii) *Primaquine diphosphate* 15 mgm. base daily for 14 days or 7 mgm. three times daily for 14 days.

During an overt attack a course of treatment with a schizontocidal drug must also be given. This applies also when falciparum malaria is associated with either a vivax or a malariae (quartan) infection. Some authorities include treatment with a schizontocidal drug even though no active symptoms are apparent.

Careful supervision is necessary over patients taking any of the 8-amino-quinoline drugs, because of the occasional unpredictable occurrence of acute intravascular haemolysis with or without haemoglobinuria.

Notes

- Each 261 mgm. tablet of *amodiaquine dihydrochloride dihydrate salt* contains 200 mgm. of base.
 - Each 250 mgm. tablet of *chloroquine diphosphate salt* contains 150 mgm. of base.
 - Each 200 mgm. tablet of *chloroquine sulphate salt* contains 150 mgm. of base.
 - Each 100 mgm. tablet of *mepacrine hydrochloride* contains 79 mgm. of base.
 - Each 375 mgm. ampoule of *mepacrine methane sulphonate* is equivalent to 300 mgm. of *mepacrine hydrochloride*.
 - Each 18 mgm. tablet of *pamaquin naphthoate* or 10 mgm. tablet of *pamaquin dihydrochloride* contains 8 mgm. of base. For practical purposes 2 *naphthoate* = 1 base = 1 *dihydrochloride*.
 - Each 13.2 mgm. tablet of *primaquine diphosphate* contains 7.5 mgm. base.
 - Each 100 mgm. tablet of *proguanil monohydrochloride* contains 87 mgm. base.
- Pyrimethamine is prescribed in the form of base, *not* as a salt. A tablet contains 25 mgm. base.

Antimalarial drugs and their synonyms †

AMODIAQUINE	CHLOROQUINE	MEPACRINE	PAMAQUIN
Cam-aqi	*Aralen	Acrichin ‡‡	Aminoquin
CAM-AQ1	*Avloclor	Acriquine	Beprochin
Camoquin	**Nivaquine B	Atabrine	Fourneau-710
Flavoquine	Resochin	Atebrin	Gamefar
Miaquin	Tanakan	Atebrine	Pamaquine
SN 10751	SN 7618	Chemiochin	Plasmochin
	3377 RP	Chinacrin	Plasmocide
		Crinodora	Plasmoquine
		Erion	Praequine
		Haffkinine	Quipenyl
		Italchina	Rhodoquine
		Malaricida	
		Methoquine	
		Metoquina	
		Metoquine	
		Palusan	
		Quinacrine	
PROGUANIL	PRIMAQUINE	PYRIMETHAMINE	
Bigumal	SN 13272	B-W 50-63	
Chlorguanide		Daraprim	
Chloriguane		Malocide	
Diguanyl			
Drinupal			
Guanatol			
Paludrine			
Palusil			
Tirian			
M 4888			
SN 12837			
3359 RP			

† In the WHO Technical Report Series No. 80, 1954, Expert Committee on Malaria, Fifth Report, a list of synonyms similar to this is given, but it includes Sontoquine, of which the synonyms are Nivaquine A, Nivaquine C, Santoquin, Santoquine, Sontoquin, SN 6911 and 3038 RP. No details of dosage or use of sontoquine are given in that report.

‡‡ See RUBENSTEIN, this *Bulletin*, 1937, v. 34, 173.

* Aralen and Avloclor are chloroquine diphosphate.

** Nivaquine B, or Nivaquine, is chloroquine sulphate.

SUMMARY OF RECENT ABSTRACTS ***VII. HELMINTHIASIS †**

(Continued from p. 758)

NEMATODES*General*

HARWOOD (p. 952) has published a preliminary list of common names of a number of helminths.

Surveys of helminthic infections are reported from Poland (STRYJECKA-USTUPSKA, p. 525), Japan (RITCHIE *et al.*, p. 525), Surinam (BLUMBERG *et al.*, p. 1067), and Brazil (LOBO *et al.*, p. 128; RIBEIRO, p. 820; BALTHAZAR, p. 821).

In comparisons of various techniques for examination of faeces for helminth eggs, RIBEIRO (p. 526) describes a method which gave better results than the Faust method, and HELLMEISTER and PEREIRA (p. 821) used a modified Faust technique which appeared to be more effective than the original. JOSEPH (p. 952) prefers sedimentation to concentration techniques.

ELSDON-DEW (p. 538) notes that the eggs of the eelworm (*Heterodera*) may be swallowed and may then be found in the faeces, where they may be mistaken for eggs of various intestinal worms.

Some apparent increase in oxalic acid content of blood and urine was found by DE PAOLA and MASTRANDREA (p. 1068) in certain helminthic infections.

The relationship of allergy with helminthic diseases is discussed by DA FRANÇA (p. 526), who points out that the best treatment for this condition is expulsion of the parasite.

Hookworm Infections, Strongyloides, etc.

Experiments carried out by BEAVER (p. 737) support the view that alternate wetting and drying of the soil hastens the deaths of infective hookworm larvae. In well-drained sandy regions, infective larvae remain viable on the surface for only a few minutes after rain ceases, and in the absence of added contamination the soil becomes practically non-infective after brief periods of frequent rainfall.

BRUMPT (p. 430) infected patients (suffering from polycythaemia or hypertension) with hookworm larvae (initial dose about 425 larvae) and studied the course of the infection uncomplicated by other diseases or dietary deficiencies. Local cutaneous lesions were observed at the points of entry of the larvae, and upper respiratory symptoms occurred later (but there was no suggestion of Loeffler's syndrome), and duodenitis which produced abdominal symptoms. This soon cleared up, but diarrhoea sometimes continued for a month. The red cell count fell, and then rose again though not to its former level, but in some women severe hypochromic anaemia resulted, which required intensive iron treatment. Eosinophilia to 70 or 75 per cent. was common with a peak at 3 months, falling to 15 per cent. The number of eggs per gm. of faeces was about

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1953, v. 50. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

† For previous articles on helminthiasis in this series see the August and September issues of the *Tropical Diseases Bulletin* each year since 1939.

11 times the number of infecting larvae. The infection varied in the length of time it persisted—in some cases the eggs were scanty at 2 years, in others they were plentiful. There was no suggestion of immunity. The author thinks that there is a direct toxic action on the haemopoietic system.

HEILIG (p. 132) refers to a condition of extreme anaemia associated with only a few hookworm eggs in the faeces, which he has seen in India, and recalls his own work which suggested the existence of a hookworm toxin. In comment Napier states that this anaemia has never been explained; it can be cured by haematinics alone, and Heilig points out the need to bring the haemoglobin up to a reasonable level before anthelmintics are given. RODRÍGUEZ-MOLINA and OLIVER-GONZÁLEZ (p. 535) studied a few patients heavily infected with hookworm in Puerto Rico, showing that administration of iron by mouth produced striking improvement, but that administration of an anthelmintic was necessary to end the hypochromic anaemia. Parenteral liver extract was not useful. The authors refer to the part played by prolonged inadequate diet in producing this syndrome.

FERREIRA and DE ALMEIDA (p. 737) describe the clinical condition of patients with hookworm infection in Portuguese Guinea, and the effect of treatment.

RICCI and MENNA (p. 725) have used hexylresorcinol against various intestinal worms, with success, and MONGELLI SCIANNAMEO (p. 635) gives a dose of 3–5 gm. of chloroform in 30–40 gm. castor oil (freshly prepared), and finds it useful in hookworm infection.

MUHLEISEN (p. 827) describes a case of creeping eruption in which larvae, probably of *Ancylostoma brasiliense*, were found in the sputum. The patient did not develop intestinal infection.

Trichostrongylus infection is reported by NEGHME and SILVA (p. 133) from Chile.

COUTINHO *et al.* (p. 828) show that larvae of *Strongyloides stercoralis* are more frequently found in the faeces than in the duodenal contents; in no instance was the duodenum positive and the faeces negative. RODRIGUEZ-MOLINA (p. 133) reports a considerable amount of *Strongyloides* infection in Puerto Rico, but an analysis of abdominal symptoms which could be referred to this infection showed that they were usually mild. Treatment with gentian violet was useful in a few cases. In Ethiopia RIZZOTTI (p. 536) has used gentian violet by mouth, with moderate success. COUTINHO *et al.* (p. 537) found diethylcarbamazine disappointing.

Syngamus laryngeus infection of man is reported by LIMA and BARBOSA (p. 1158).

Ascaris

A map showing the incidence of *Ascaris* infections in children in part of Germany has been prepared by SEITZ (p. 828). The heavily infected areas are predominantly rural and for this the use of human faeces for manuring vegetable crops is blamed. ANDERS (p. 432) shows that in Berlin the highest rates in schoolchildren (14·3 per cent.) were in those living in districts supplied with cesspits which were insufficient in number, and from which the contents were pumped on to the gardens. Rates in rural areas were also high.

In a survey of Thailand SADUN and VAJRASTHIRA (p. 635) found that *Ascaris* was the commonest helminth in urban areas (in both adults and children) but that in rural areas hookworm predominated.

In part of Georgia, U.S.A., the incidence of *Ascaris* is relatively low, though hookworm infection is common. This appears to be due to the

sandy nature of the topsoil, which does not contain enough light colloidal elements to retain surface moisture and to stratify the *Ascaris* eggs just below the ground surface where they are protected against desiccation and direct sunlight, and are well placed for transfer to new hosts (BEAVER, p. 229). On the other hand, as a result of an experiment in which strawberries grown on soil contaminated once with *Ascaris* eggs were eaten each year for several years, MÜLLER (p. 829) concludes that these eggs can remain infective in soil under these conditions for at least 6 years. TAKEYAMA (p. 636) has studied the effect of human urine on eggs of *Ascaris*; ROGERS (p. 323) points out that they are easily broken and become unrecognizable if slide preparations are too vigorously pressed to remove air bubbles.

ÜNER (p. 961) has used an extract of *Ascaris* for skin tests, but the results seem to indicate that positive reactions are obtained not only in patients with *Ascaris* infections but also in persons with other parasites.

DIETHELM and HEUCK (p. 738) discuss the radiological diagnosis of *Ascaris* infection, finding many cases in this way which could not be diagnosed by examination of faeces for eggs. Intestinal obstruction due to *Ascaris* is described by ROMBERG (p. 1068).

FRANK and PAUL (p. 230) followed the course of transient pulmonary eosinophilia in 9 patients up to the appearance of *Ascaris* in the bowel, but failed to find larvae in the sputum, and VAN GINKEL (p. 563) refers to a case of prolonged pulmonary eosinophilic infiltration in which *Ascaris* eggs appeared in the faeces 3 months after onset.

KAKIZAKI (p. 324) comments on the local changes (abscesses, atrophy, scarring) which occur in the liver in bile-duct ascariasis.

Studying the effect of *Ascaris* infection on the nutrition of the host, VENKATACHALAM and PATWARDHAN (p. 830) conclude that the worm secretes anti-enzymes to protect itself from digestion.

JASWANT SINGH *et al.* (p. 133) used diethylcarbamazine in the treatment of ascariasis; the dose was 2 mgm. per kgm. twice each day for 5 days, but about two-thirds of the patients continued to pass eggs after it. In children rather bigger doses caused great reduction in the numbers of eggs passed. In the Gold Coast COLBOURNE (p. 433) used doses of 14 mgm. per kgm. once daily for 4 days, and found it as effective as chenopodium. In Malaya THOMSON (p. 433) gave 20 mgm. per kgm. daily for not less than 4 days (preferably 7) with success.

SPRENT (p. 45) suggests that there are anatomical differences in the denticles of human and pig strains of *Ascaris*.

SHINOZAKI and HASHIMOTO (p. 537) report immunological studies with the body fluid of pig *Ascaris*.

Filarial Infections

Wuchereria bancrofti

The Report for 1951 of the Filariasis Research Unit of the East Africa High Commission (p. 45) shows that the disease is very common in the warm, damp parts of Tanganyika, and that microfilariae have been found in infants under 1 year of age. Elephantiasis and hydrocele constitute a heavy drain on hospital facilities. Skin tests and complement-fixation tests were disappointing. Therapeutic trials were made with diethylcarbamazine and with other drugs which are still of uncertain value. *Culex fatigans* has not proved a good vector in laboratory conditions.

In a survey of blood films in Liberia, YOUNG (p. 1158) found *W. bancrofti* but no microfilariae of other species.

RACHOU and DEANE (p. 538) report a considerable incidence of *W. bancrofti* infection in Brazil. *Mansonella ozzardi* is also found.

An interesting article on filariasis (*W. bancrofti*) in the Maldives Islands has been published by IYENGAR (p. 636), who notes endemicity rates of 21 to 40 per cent. Elephantiasis is common, and the usual observation was made that with the onset of signs of filarial disease the incidence of microfilaraemia tends to decline. The disease rate shows a progressive rise in the successive age groups; infection is quite common in childhood. The embryos show nocturnal periodicity and the chief vector is *Culex fatigans*, which breeds prolifically. *Anopheles tessellatus* is also an efficient vector but does not breed in large numbers, and does not appear to cause endemic filariasis in the absence of *C. fatigans*. The breeding of *C. fatigans* is closely associated with step-wells, which should be abolished; and the author gives instructions on the construction of wells.

FROS and WINCKEL (p. 434) have studied the development of microfilariae of *W. bancrofti* inside and outside the adult worm. FROS and LIQUI LUNG (p. 1158) observed that, in thick blood films kept in a damp atmosphere, microfilariae of *W. bancrofti* tended to emerge from their sheaths after 2-6 hours, and that eosinophiles tended to cluster round the sheathless embryos.

BRYGOO and AIGLE (p. 324) studied the nocturnal periodicity of *W. bancrofti* embryos in south Vietnam.

CASILE and SACCHARIN (p. 740) have used an antigen from *Dracunculus medinensis* for an intradermal test for filariasis. Of 67 cases showing evidence of filariasis the test was positive in 45, but microfilariae could be found in only 31.

JANSSENS (p. 52) discusses the possible psychological manifestations of filariasis, and its effects on the nervous system.

WINCKEL and FROS (p. 435) have studied acute lymphadenitis in *W. bancrofti* infection, concluding that adult worms do not cause it but that the death of the parasite brings about the reaction. DEJOU (p. 324) discusses the lymphatic lesions associated with elephantiasis.

Diethylcarbamazine has been used in treatment. In the Gambia McGREGOR *et al.* (p. 232) gave 5 mgm. per kgm. daily for 5 days, and 64 per cent. of the patients were free from microfilariae 10 months later; it seems likely that there was some permanent effect on the adult worms and the reservoir of microfilariae available for transmission was greatly reduced. Disagreeable side effects were common, and the villagers soon tired of them. In Puerto Rico SCHOBINGER VON SCHOWINGEN (p. 232) gave higher doses, 2-5 mgm. 3 times daily for up to 10 days, with fairly good results; toxic symptoms varied with dosage. NOR EL DIN and EL TAMIMI (p. 541) found it useful in elephantoid fever with lymphangitis, and to some extent in lymph-scrotum, hydrocele and lymphadenitis; it may be used with penicillin for secondary infections, and with an antihistaminic compound for allergic effects.

Dapsone (DDS) appears to have some effect on the fever and lymphangitis of filariasis (BHADURI and CHOWDHURY, p. 834).

MANSON-BAHR (p. 231) recapitulates his views on the non-periodic filaria which, he considers, should be known as *Wuchereria pacifica*, spread chiefly by *Aedes scutellaris polynesiensis* which, being a day-biter in gardens and plantations, is difficult to control. The features of this infection are gross enlargement of the epitrochlear glands, and elephantiasis of arms and breasts, against the lymphuria, chyluria and elephantiasis of the legs of the nocturnal, periodic, infection. He (p. 542) sums up the control work which has been done against filariasis in the Pacific.

JACHOWSKI and OTTO (p. 50) from American Samoa emphasize the point that the vector, *Aëdes pseudoscutellaris* [? *Aëdes scutellaris polynesiensis*], is much more prevalent, and bites much more, in the bush than in the villages, and that residual spray cannot therefore be expected to be effective in control.

Preliminary observations on filariasis in the Society Islands are reported by BEYE *et al.* (pp. 47, 738), who have made an extensive survey and have carried out measures of control which included restriction of breeding and the use of insecticides. They describe the mosquitoes found, and the infection rates of *Aëdes pseudoscutellaris* [*Aëdes scutellaris polynesiensis*]. Treatment with diethylcarbamazine formed part of the programme, and this caused reduction in the infection rates. The abstracts of these reports should be read in full.

In a series of examinations of blood taken at different times of the day and at different periods of the year, EDGAR *et al.* (p. 539) in Tahiti found consistent evidence of a small rise in numbers of embryos in the peripheral blood in the evening; the rise was more striking in children than in adults. The fluctuations did not reach the pronounced proportions seen in *W. bancrofti* of other parts of the world.

MANSON-BAHR (p. 542) has shown that a dose of 150 mgm. diethylcarbamazine daily for up to one month cannot be relied upon to clear the blood of microfilariae of *W. bancrofti* (non-periodic form). It may be useful in preventing infection of mosquitoes. In American Samoa a comparison was made by OTTO *et al.* (p. 832) between diethylcarbamazine and arsenamide as therapeutic agents in non-periodic filariasis. Diethylcarbamazine produced the usual rapid reduction in microfilariae, but these usually reappeared slowly during the subsequent months; this may be a result of reinfection or of recovery of some of the adult worms. Arsenamide (injected intravenously in 15 daily doses) reduced the number of microfilariae more slowly, but 9 of 12 patients treated were free 2 years later.

Wuchereria malayi :—

A pure focus of *W. malayi* infection has been found in a small Japanese island; the main vector is *Aëdes togoi* (this genus not having before been implicated with *W. malayi*). SASA *et al.* (p. 741) think that the infection may have been introduced by castaways from Korea or S. China where *W. malayi* abounds. The microfilariae exhibit nocturnal periodicity. A modification of diethylcarbamazine was very effective against the microfilariae and also probably against the adult worms.

In feeding experiments REID (p. 434) has observed that *Anopheles barbirostris* feeding on blood containing microfilariae of *W. malayi* [not *W. bancrofti*] usually discharged some of the blood (containing microfilariae) from the tip of the abdomen during feeding, whereas *Mansonioides annulifera* in the same circumstances voided only clear serum which did not contain microfilariae. This may have a bearing on transmission, and may be related to concentration of microfilariae believed to occur in some mosquitoes. JAYEWICKREME and NILES (p. 52) have elaborated a successful technique for rearing *Mansonioides* species in the laboratory.

Onchocerca :—

Onchocerciasis is common in French West Africa, and JONCHERE and PFISTER (p. 325) estimate that 10 per cent. of the 200,000 infected persons have more or less serious ocular complications, and about 2·5 per cent. are blind.

VARGAS (p. 135) has studied the conditions in which embryos of *O. volvulus* may be kept alive *in vitro*.

LEWIS (p. 543) has written a long monograph on *Simulium damnosum*, which is found widely over the river systems of the south-west Sudan. It breeds in the rainy season (chiefly May–October) and may disperse widely (up to 30 km.) from the breeding places. It appears to feed almost exclusively on man, though it visits flowers; it bites usually below the knee, feeding every 2–3 days, usually in the open. A peritrophic membrane is secreted round the blood meal, and tends to trap many of the microfilariae, but some escape as the membrane forms, or through an incompletely closed membrane. The author notes that blindness is found only in areas of intense reinfection; he discusses prevention, and mentions the use of dimethyl phthalate.

A long monograph on onchocerciasis has been written by WANSON (p. 136), who shows that in the Belgian Congo the two vectors are *Simulium damnosum* and *S. neavei* [*S. renauxi* has been suspected but may be a race of *S. neavei*]. *S. damnosum* breeds on water plants and the sticks of fish traps in the river, and on stones during the spate in March–April. The development from egg to adult takes 9 days, and the emerged female lives 3 weeks. Biting when the sky is overcast takes place all day, but otherwise mostly in the morning and evening. The riverine forest climate favours migration, but this does not usually exceed 35 km. Infective larvae were found in 1·76 per cent. of *S. damnosum*. Clinical details are described. Nodules were found in two-thirds of the population of Léopoldville and 45 per cent. of Europeans examined by scarification were positive. Control by the use of insecticide in river water is not practicable because such enormous quantities would be needed, but the spraying of insecticide on resting places (vegetation) has been useful, though the residual effect is very short. Treatment with antrypol is successful in up to 70 per cent. of cases—it acts on the adult worm. Diethylcarbamazine was not found satisfactory. WANSON and LEBIED (p. 545) have studied the gonotrophic cycle in *S. damnosum*, noting that the fly may be infective 6 days after the infecting meal. Females (which normally appear to live only about 2 weeks) may perhaps complete 3 gonotrophic cycles, though there is no evidence of this.

In Guatemala experiments with marked *Simulium* species showed that they would be caught as far as 9·7 miles from the point of release (and probably further) and 2,300 feet above it. DALMAT (p. 658) shows that they may live up to (and probably beyond) 85 days. NETTEL (p. 546) reports the species of *Simulium* captured on man and animals in Mexico; *S. ochraceum* was found feeding on man only. Laboratory experiments on persons infected with *O. volvulus* showed that *Simulium veracruzarium*, *S. cristogram* and *S. haematopotum* are potential vectors (GIBSON and DALMAT, p. 235).

In a considerable paper TOULANT and BOITHIAS (p. 448) discuss the lesions of the fundus of the eye in onchocerciasis—choroido-retinitis, oedema and haemorrhage of the retina, optic atrophy. The lesions are probably due directly to the microfilariae, not to superimposed infections or nutritional defects. Examination of the eyes may lead to a correct diagnosis before nodules appear. The diagnosis is comparatively easy, and the lesions of the fundus can be distinguished from those of trypanosomiasis or syphilis. Treatment by removal of onchocerca nodules and the use of diethylcarbamazine is advocated.

Diethylcarbamazine has been used in treatment. ADAMS and WOODRUFF (p. 546) obtained only poor results; it may temporarily alleviate the skin

condition, but cannot be relied upon to eradicate the infection. On the other hand PIERS (p. 837) claims it as the drug of choice, though its action may be only suppressive. It eliminates embryos from the skin, but GIBSON and BURCH (p. 639) show that they reappear within a few months and are still capable of developing in *Simulium*, so that the drug is not useful in prophylaxis unless repeated every few months.

MARTÍNEZ BÁEZ (pp. 437, 1070) believes that it acts on adult *O. volvulus*, and quotes findings which indicate that the longer the interval (up to 1 year) between administration and extirpation of a nodule, the higher the proportion of dead worms found. Diethylcarbamazine produces a rapid fall in eosinophilia and disappearance of microfilariae, but MARTÍNEZ BÁEZ and TELLO DE LA PEÑA (p. 325) explain this in terms of allergic shock following the rapid death of large numbers of microfilariae. Intense allergic reactions are provoked in patients with ocular onchocerciasis on treatment with large doses of diethylcarbamazine, but the Report for 1951 of the Filariasis Research Unit of the East Africa High Commission (p. 45) shows that there is no evidence of damage to the eye; it can safely be given to patients with early eye lesions.

BAYLET (p. 1070) injected diethylcarbamazine into onchocercal cysts themselves, but in the older cysts, which are usually collections of small cysts, the drug could not reach all the worms, and the results were disappointing.

NETTEL (p. 135) states that onchocerciasis is fairly widespread in central America, and the incidence of ocular involvement is high. He refers to the entomological work done on this disease. The principal vector is *Simulium ochraceum*, and he (p. 234 bis) discusses control, especially with insecticides introduced into streams. He further considers other methods of control, including the removal of vegetation and the use of larvicides, and other antilarval measures, and discusses the technical, administrative and economic issues involved in control (NETTEL, p. 326 bis).

Loa loa, etc.:-

A study of *Chrysops silacea* by GORDON and CREWE (p. 747) indicated that it feeds from a pool of blood formed in the deeper layers of the skin as a result of several thrusts of its fascicle, during which action the anticoagulant in the saliva prevents clotting. Infective larvae of *L. loa* escape from the proboscis during the act of feeding, but experiments indicate that they cannot penetrate the intact skin, and presumably enter through the wound made by the biting fly.

KIVITS (p. 52) comments on the rarity with which infection of the cerebro-spinal fluid with microfilariae of *Loa loa* has been reported, and describes 4 cases of encephalitis, all fatal, in which substantial numbers of microfilariae were seen in the fluid. It seems probable that the encephalitis may have favoured the penetration of the microfilariae into the fluid as a secondary event, but on the other hand the filarial infection may have been the cause of the encephalitis.

TEN BERG (p. 53) thinks that in certain cases *L. loa* may exert a serious influence on the general health, and notes that it has responded well to treatment with diethylcarbamazine. (*D. perstans* infection did not respond, but see below.) STONES (p. 436) has been successful with comparatively low doses, but BRUMPT (p. 135) thinks that the usual course does not kill all adult *L. loa*.

PEEL *et al.* (p. 5) think that in the region of Costermansville, Belgian Congo, infection with *Dipetalonema perstans* is acquired locally, but that other filarial infections are contracted outside the area.

HOPKINS and NICHOLAS (p. 1069) have confirmed the original statements of Dyce SHARP that *Culicoides austeni* is a vector of *D. perstans*, a view which was disputed a few years ago. *C. grahami* is a possible, but poor, vector. HOPKINS (p. 134) found larvae of *Culicoides grahami* and *C. austeni* in the rotting tissues of banana stumps, and these species are closely linked with human farming activity; both bite man, and larvae of *D. perstans* were found in *C. austeni*. A study of the distribution of *Culicoides* spp. which bite man in the rain-forest, the forest fringe and the mountain grass-lands of the British Cameroons has been published by NICHOLAS *et al.* (p. 748), who discuss the breeding places—rotten stumps of banana and plantain, and other aquatic habitats rich in organic matter.

McGREGOR *et al.* (p. 232) show that diethylcarbamazine was effective in eradicating embryos of *D. perstans* from 72 per cent. of treated persons in the Gambia. The dose was 5 mgm. per kgm. daily for 5 days. LEIMANN DE ALMEIDA (p. 435) was moderately successful with doses of 10–15 mgm. per kgm. daily for up to 16 days.

Other filariae:—

HAWKING (p. 743) has obtained clear evidence that in *Dirofilaria repens* the phenomenon of microfilarial periodicity, though it involves the host, is equally a property of the microfilariae. Periodicity continued after transfusion of blood containing microfilariae, and this showed that it was independent of the presence or absence of adult worms.

McFADZEEAN (p. 640) makes the point that the more perfect the adaptation of a parasite to its host, the less the immune response it provokes. He has studied the responses in animals infected with *Dirofilaria repens* and other filariae which are non-pathogenic to their hosts—the immune responses were slight.

KARTMAN (p. 835) has made a detailed study of the factors which influence infection of mosquitoes with *Dirofilaria immitis*. There is a genetic influence in susceptibility, but it cannot yet be shown that it is controlled by a simple Mendelian recessive. The abstract should be read in full.

BERTRAM (p. 834) has made a study of *Litomosoides* infection and superinfection in the cotton rat, and relates his findings to occurrences in human filariasis, postulating that there may, in the latter, exist primary and secondary sites for the development of the adult worms, with freer reproduction in the secondary sites and a higher incidence of microfilaremia. In the discussion on this paper KERSHAW put forward the view that absence of microfilaremia in a proportion of the young who harbour adult worms may be due to factors other than the postulated primary and secondary sites, for instance failure of males and females to meet, or to some suppressive mechanism. He (p. 746) reports studies on the early migration of infective larvae in the cotton rat, and FREER (p. 746) studies on the fate of microfilariae after ingestion by *Bdellonyssus bacoti*.

SCOTT and MACDONALD (p. 743) have studied partial immunity provoked by *L. carinii* in cotton rats. Some protection was given to rats exposed to mites infected with *L. carinii* by prior injection of the Friedheim antimony compound known as MSb (KERSHAW and WILLIAMSON, p. 436). The same authors (p. 436) studied the retention and distribution of the drug.

Dracunculus

In south-west Nigeria infection with *Dracunculus medinensis* is common where drinking water must be obtained from ponds, but not in towns or

villages near perennial streams. ONABAMIRO (p. 235) shows that 5 species of *Cyclops* can harbour the larvae long enough for development to the infective stage, and (p. 54) has studied the diurnal migration and seasonal fluctuation of *Thermocyclops nigerianus*, which is commonly infected in Nigeria.

Enterobius, Trichuris, Trichinella

In tests of the comparative efficiency of various diagnostic techniques for *Enterobius* infection, WATSON and MACKEITH (p. 328) found the adhesive Cellophane swab method the method of choice (the glass pestle was also very reliable), but if the patient is an adult male with abundant perianal hair the toilet paper (TP) technique is preferable. The TP technique is described. *Enterobius* infection was found in 46 per cent. of children examined by RICCI (p. 327) in the island of Ischia; the rate has probably increased recently. DOWSETT and BROWN (p. 838) treated *Enterobius* infection in children with diphenan, but the results were disappointing, even with high doses. The incidence in the schoolchildren was about 80 per cent. COUTELEN *et al.* (p. 140) and BUMBALO *et al.* (p. 838) report disappointing results with Egrassin. SCHOLTEN (p. 139) shows that various triphenylmethane dyestuffs (gentian violet, etc.) which are useful in the treatment of *Enterobius* infections are irritating to the gastric mucous membrane, but that this property may be avoided if the carbinol bases of the dyestuffs are used.

HSIEH (p. 140) and THOMPSON and REINERTSON (p. 235) have tested various drugs in natural pinworm infections of mice.

KOURÍ and VALDÉS DÍAZ (p. 54) do not accept the view that *Trichuris trichiura* is harmless, and they describe a condition of massive infection in children, with inflammation and haemorrhage in the colon, which resists treatment and may be fatal. Similarly, JUNG and JELLIFFE (p. 55) hold that this infection may be severe, with pain, diarrhoea, blood in the stools and anaemia, especially in ill-nourished African children. For treatment they recommend enemata of hexylresorcinol, or tetrachlorethylene and chenopodium given by mouth. GUILLOU (p. 641) reports a case in which gastrointestinal disturbance, purpura, slight anaemia, delay in coagulation and enlarged spleen were associated with massive *Trichuris* infection and disappeared after courses of thymol had successfully cleared the infection. In Berlin infection of children with *Trichuris* is fairly common; ANDERS (p. 432) noted slight or distinct symptoms in half of the infected children.

In Milan BEVARCQUA (p. 962) found *Trichuris* in 20 per cent., and *Ascaris* in 7·8 per cent. of schoolchildren.

HALES and WELCH (p. 630), and WESTON *et al.* (p. 641) have studied the anthelmintic action of a cyanine dye (No. 715) in animals. Various side effects were noticed. PÉREZ-SANTIAGO *et al.* (p. 1066) used it in hookworm and *Trichuris* infection, but conclude that it is not as effective or as well tolerated as tetrachlorethylene.

CABALLERO and GROCOTT (p. 1071) note that the eggs of *Capillaria hepatica*, sometimes ingested and passed by man, may be mistaken for those of *Trichuris*.

In a conference held in the United States (PUBLIC HEALTH REPORTS, p. 749) on trichiniasis an estimate was announced that 1 in 6 persons in that country are infected and that 4·5 per cent. of these show symptoms. Various aspects of the disease in man and animals are discussed, and measures of control.

BECK (p. 641) states that examination of 1 gm. of suspected diaphragm by the compression technique is by no means certain to detect all infections, and has obtained considerably more accurate results by a xenodiagnostic method which involves giving suspected tissues to rats and observing the resulting infections. GAASE (p. 55) uses the complement-fixation test, which gives a high proportion of positive results even in the first week, and is considered to be highly specific. THOMAS *et al.* (p. 750) show that flocculation and complement-fixation reactions are capable of detecting specific antibodies in infected rabbits.

In trichiniasis KOZAR *et al.* (p. 236) note the typical symptoms of palpebral oedema, headache, muscular pains, pyrexia and eosinophilia. Precipitation tests may be valuable, but tend to become positive only late in the disease. Complement-fixation tests are specific and sensitive. Allergic tests were positive in the 4th month in over half the cases discussed. The ocular manifestations are described by CROLL and CROLL (p. 341); there is extreme swelling of the eyelids, chemosis of the conjunctiva and pain in the eyeballs with limitation of movement. Three cases with involvement of the central nervous system and electrocardiographic abnormalities are described by SCOTT *et al.* (p. 141).

An arsenoso compound used experimentally by Soo-Hoo (p. 237) seemed to be effective in trichiniasis in mice.

X-rays can sterilize trichinous pork, and GOULD *et al.* (p. 642) think that the dose required may not be excessive.

Other Nematodes

Gongylonema infection is reported from S. Carolina by YOUNG and HAYNE (p. 327); the source of infection was obscure, but contaminated well water was probably involved.

Two cases of *Gnathostoma* infection, apparently due to eating infected fish, are described from Japan by KITAMURA (p. 139). Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control; Animal malaria—monkeys, other animals, birds.

BREIMER, H. B. G. Dubbele infectie van een erythrocyt met *Plasmodium malariae*. [Double Infection of an Erythrocyte with *Plasmodium malariae*] Nederl. Tijdschr. v. Geneesk. 1954, May 22, v. 98 (ii), No. 21, 1440–42, 1 fig. [17 refs.]

The English summary appended to the paper is as follows:—

“Description of a case of double infection of an erythrocyte with two taeniod Plasmobia malariae. According to the literature, double infection of red blood corpuscles is very rare with *Pl. malariae* and *Pl. ovale*, infrequent with *Pl. vivax*, and common with *Pl. falciparum*. Invasion of individual red blood cells by more than two malaria parasites is common with *Pl. falciparum* and rare with *Pl. vivax* infections.”

LOVE, G. J. **Variations in hatching of Ova in Successive Lots obtained from Colonized *Anopheles quadrimaculatus* Say.** *J. Econom. Entom.* 1954, Feb., v. 47, No. 1, 178-9.

LOOMIS, G. W., HELLER, P., HALL, W. H. & ZIMMERMAN, H. J. **The Pattern of Hepatic Dysfunction in Malaria.** *Amer. J. Med. Sci.* 1954, Apr., v. 227, No. 4, 408-16, 6 figs. [45 refs.]

Various hepatic function tests were carried out in 75 veterans from Korea infected with *P. vivax* and being treated either with chloroquine or with quinine and pentaquine. The patients had taken chloroquine regularly during exposure and only 3 had had attacks of malaria in Korea.

The results of the tests were in agreement with those of other workers. Those most frequently found abnormal were the flocculation reactions, abnormalities of which persisted into convalescence. Changes in dye excretion were common but appeared early and were transitory.

The relevant literature is briefly discussed. It is concluded that the basis for the impaired bromsulphthalein excretion must be transient. Impairment of excretion may be "reflection of decreased delivery . . . to the hepatic cell because of decreased blood flow and not necessarily a reflection of parenchymal damage". The persistence of abnormality in the flocculation tests suggests there is another factor at work which affects both hepatic and extrahepatic protein; the function of both liver and reticulo-endothelial system might be involved.

[In the discussion the abstracter is misquoted as stating that the decreased hepatic blood flow "is the result of fever".] *B. G. Maegraith*

See also p. 1007, JASWANT SINGH, RAY & NAIR, J. S. B., **Stain—its Preparation in the Powder Form and the Staining Technique.**

MONNEROT-DUMAINE, M. Les mystifications de l'hématozoaire. [**The Perplexities of Malaria**] Reprinted from *Presse Méd.* 1954, Feb. 13 & Mar. 10, v. 62, Nos. 11 & 18, 231; 387-8.

The author gives an interesting but diffuse account of some of the protean complications of malaria, common and uncommon. He ends by emphasizing that malaria may be responsible for a tremendous range of pathological states, and should always be considered as an aetiological factor by the physician confronted by a difficult case, whether in the tropics or elsewhere.

[The effect of the original would be lost by any attempt at a review.]
B. G. Maegraith

GARNHAM, P. C. C. **Malaria in the African Child.** *East African Med. J.* 1954, Apr., v. 31, No. 4, 155-9.

Children from tribes which are susceptible to malaria suffer somewhat more severely than does the European child, because with less care bestowed on them they come later under treatment. Children in highly immune tribes acquire malaria less frequently than one might expect and suffer less severely. Among 75 children in Kisumu, Kenya, receiving only small quantities of quinine only 1 died in 2 years from malaria. The author recently examined 133 children in Uganda, finding numerous malaria parasites in 110, though not a single one was in any way ill; the infections

were mainly due to *Plasmodium falciparum*, with *P. malariae* a good second. *P. malariae* may cause a nephrosis which can be fatal and even *P. vivax* does at times kill infants.

It is concluded that the apparent commensal existence of the parasite in the "immune" is still a mystery only to be solved by eradication of the vector (or constant treatment) and observing the resultant changes in physique and health.

G. Macdonald

MONTENY, V. A. R. Les injections intraveineuses de quinine dans le traitement de la malaria chronique. [Intravenous Quinine in the Treatment of Chronic Malaria] *Ann. Soc. Belge de Méd. Trop.* 1953, Dec. 31, v. 33, No. 6, 681-6, 9 charts on 2 pls. [11 refs.]

The effects of intravenous quinine therapy on "chronic" malaria (*P. falciparum*, *P. vivax* and *P. malariae*) were compared in groups of adults (Bantu and Nilotic) in North-east Belgian Congo. Group I (200 patients), received 100 mgm. quinine hydrochloride in 10 cc. (water, physiological saline or 5 per cent. glucose solution) intravenously on 4 successive days; Group II (200 patients), received 150 mgm.; Group III (200 patients), 200 mgm. Others received larger doses in the same routine. All were followed up for 2 months. The most successful régime was 200 mgm. daily for 4 days (Group III). On this dosage there were no relapses (or reinfection) during the two months following infection.

The author claims that no other specific treatment is as effective as quinine under these circumstances. Infants, and subjects in shock or with low arterial pressure, should not receive intravenous quinine therapy. [Few would agree that shock is a contraindication for intravenous chemotherapy, even when quinine is used. Most workers hold the opposite opinion, including DE LANGEN, who is quoted by the author. See also BONEBAKKER, below.]

B. G. Maegraith

NETHERLANDS SOC. TROP. MED. Meeting of October 19th, 1952, in the Institute of Tropical Hygiene and Geographical Pathology, Amsterdam [VAN STEENIS, P. B., Chairman]. Subtertian Malaria and Shock [BONEBAKKER, A.]. *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, Dec., v. 5, No. 4, 354-7.

The importance of the development and treatment of shock in *P. falciparum* malaria was stressed by Dr. BONEBAKKER, who gave details of 2 cases treated immediately and successfully for both the vascular collapse and the malaria. A short outline of relevant literature was given. In the discussion which followed, the relative merits of intravenous and intramuscular chemotherapy in algid malaria were considered. It was agreed that the former is preferable and that the shock must also be treated immediately. Intravenous quinine was the therapy of choice. Dr. Bonebakker stated that his patients were treated with nivaquine [presumably nivaquine B (chloroquine)], which was given intramuscularly, as "the manufacturers advise against" its use intravenously. [A surprising comment in view of the recent successful use of nivaquine by the intravenous route.]

At the same meeting Dr. LIEM gave an account of *Plasmodium berghei* in the rat, and in the subsequent discussion stated that an attempt to induce infection with this parasite in man had failed. B. G. Maegraith

PETER, G. **Nivaquine and Camoquin in Malaria.** *South African Med. J.* 1954, May 1, v. 28, No. 18, 376-8. [10 refs.]

During an "epidemic" of *P. falciparum* malaria in Northern Zululand, 128 patients were treated with either nivaquine [chloroquine] or camoquin [amodiaquine]. The dosage of nivaquine used for adults was 4 tablets [600 mgm. base] twice on first day, 2 tablets twice on second and third days; dosage of camoquin was 3 tablets [600 mgm. base] as a single dose.

All patients had positive blood films. Seventeen were Europeans, 15 of whom received nivaquine. Of the non-Europeans 42 received nivaquine, the rest camoquin. All responded well.

Both nivaquine and camoquin were successful suppressives in doses of 2 tablets once or twice a week, and 3 tablets once a fortnight respectively.

The author considers camoquin preferable to nivaquine, because of the more rapid remissions of symptoms it induced, and because of the advantages of single dose therapy. (Single dose treatment with nivaquine was not tried.) The administration of suppressive dosage only once a fortnight was also a great advantage.

B. G. Maegraith

ARCHAMBEAULT, C. P. **Mass Antimalarial Therapy in Veterans returning from Korea.** *J. Amer. Med. Ass.* 1954, Apr. 24, v. 154, No. 17, 1411-15. [Refs. in footnotes.]

During the operations in Korea, the United States military personnel have received suppressive treatment with chloroquine phosphate given in a single weekly dose of 0.5 gm. (0.3 gm. of base). From April 1951 onwards batches of men returned to the United States in rotation, and during the summer of that year there was a marked increase in malaria admissions in both military and naval hospitals. It was therefore decided to give a course of primaquine to all returning personnel, but the men did not remain in any place either in Korea or Japan *en route* for a sufficient period to complete the course. It was therefore proposed to give the treatment during the voyage. Clinical trials were carried out on 2 naval vessels to find out (i) whether it was feasible to administer 15 mgm. primaquine daily for 14 days to large groups of men without special medical supervision; (ii) whether primaquine in this dosage increased the risk of motion sickness; (iii) whether motion sickness affected the ability to take and retain the drug; and (iv) whether primaquine administration begun on land would aggravate the motion sickness commonly experienced during the first 4 days at sea. Separate records were kept of Negro personnel because of the known susceptibility of dark-skinned races to toxic reactions from this class of drugs.

On receipt of a favourable report on all these points, primaquine therapy was initiated for all troops returning from Korea from December 1951 onwards. Up to the end of 1953, 332,925 men completed the full course. 21,499 received 13 days' treatment, 24,932 received 12 days' and 9,348 received 10 days' treatment on board ship. The chief reason for failure to complete the course was that on many occasions fast transports made the voyage in 10 days. All men who lacked a few days to complete the course were given the required number of tablets prior to disembarkation and instructed to continue the treatment.

After the institution of routine primaquine therapy there was a marked reduction in the admissions for malaria among the Armed Forces on active duty in the continental United States, from 13,483 and 11,856 in 1951 and 1952, respectively, to 2,742 in 1953. In evaluating these figures, the fact

that the number of service men transported by the Military Sea Transportation Service increased from 43,665 during the first 6 months of 1951 to a cumulative total of 637,027 by the end of June 1953 must be taken into consideration. Moreover, many men returning by air were *en route* for too short a time to permit primaquine therapy before arrival in the United States.

There were surprisingly few toxic reactions. Two men were reported to be allergic to the drug. In one man severe urticaria developed which disappeared on discontinuance of drug therapy and reappeared when this was resumed. In two men methaemoglobinæmia developed, and in one haemolytic anaemia. There were a few reports of mild to moderate dusky cyanosis which did not necessitate discontinuance of the drug.

G. Covell

DEANE, L. M., SUTTER, V. A., MANCEAU, J. N. & ANDRADE, G. C. Experiência de campo, realizada na Amazônia, sobre o valor supressivo do Camoquin na malária. [Field Experiment in Amazonia on the Value of Camoquin as a Clinical Prophylactic of Malaria] *Rev. Serviço Especial de Saúde Pública*. Rio de Janeiro. 1952, Dec., v. 5, No. 2, 363-78. English summary.

This experiment was carried out in two townships in the State of Para, Acará and Irituia, with populations of 200 and 420, respectively. At the beginning of the observations the parasite rate of Acará was 42.8 per cent., *P. vivax* predominating. The parasite rate of Irituia was 34.9 per cent., *P. falciparum* predominant. The spleen rates of the two places were 75.5 and 82.5 per cent., respectively. The populations of each township were divided into two comparable groups. One group in each received a suppressive dose of camoquin once a week, from 0.1 to 0.3 gm., according to age. The members of the control group received a placebo. The populations of both places were examined weekly: any person found suffering from malaria received a therapeutic dose of camoquin, in both camoquin and control groups.

In Acará during 19 months' observation 76 persons were found harbouring parasites in the control group; only 2 were found in the camoquin-treated group. In Irituia the comparable figures were 23 and 2, during 13 months' observations. In both places *Anopheles darlingi*, the vector, was found in catching stations during the experiment. Camoquin thus appeared to be a very efficient suppressive; it was well tolerated. A decline in both spleen and parasite rates was also noted in the control groups. The authors suggest that this may have been due to a reduction in the sources of infection.

Norman White

SRIVASTAVA, R. S. & CHAKRABARTI, A. K. Malaria Control Measures in the Terai Area under the Terai Colonization Scheme, Kichha, District Nainital: 1949 to 1951. Second Report. *Indian J. Malariaology*. 1952, Dec., v. 6, No. 4, 381-94.

A preliminary report on this malaria control scheme was published in 1950 [this *Bulletin*, 1951, v. 48, 1075]. The present report deals with the progress made during the three years 1949-51. A vast area of jungle has been cleared—16,370 acres. The total area under cultivation has increased from 9,703 acres in 1947 to 26,073 acres in 1951. Immigration has caused a considerable increase of population, rendered possible by the success of

malaria control measures. Twenty new villages have been built sheltering 4,000 settlers, mostly displaced persons from Pakistan or ex-service men.

DDT residual spraying has been continued. In 1951 the number of sprayings was reduced to 4 a year; this has been found sufficient. In 1949 and 1950 the population displayed aversion to the prophylactic administration of proguanil; this was discontinued generally in 1951.

A noteworthy reduction in the spleen rates of children has been observed. A slight increase in parasite rates in 1951 was ascribed to the arrival of immigrants from the West Punjab. Parasites were found in the blood of 47 of 3,814 infants, more than half being *P. falciparum*; *P. vivax* had previously been the dominant species. Recent observations have shown *A. fluviatilis* to be the chief vector, *A. culicifacies* playing a secondary rôle. *A. minimus* was formerly believed to have been the vector of chief importance: it is now thought that it never played more than a subsidiary rôle in transmission.

The *per caput* cost of spraying operations has been reduced from Rs.4 in 1949 to Rs.1.07 in 1951.

Norman White

BHOMBRE, S. R., BROOKE WORTH, C. & NANJUNDIAH, K. S. **A Survey of the Economic Status of Villagers in a Malarious Irrigated Tract in Mysore State, India, before and after D.D.T. Residual Insecticidal Spraying.** *Indian J. Malaria.* 1952, Dec., v. 6, No. 4, 355-66.

The work described was carried out in an area of the Hassan District of Mysore State in which numerous small villages, each with a population of a few hundred people, are situated about a mile apart, in more or less close proximity to an irrigation canal. Irrigation is seasonal; water flows in the canal from mid-June to mid-January. The crops dependent on irrigation are rice and sugar cane. A preliminary survey of 22 of these villages with a total population of 4,614 was carried out. The spleen rate of 424 children under the age of 12 was 75·4 per cent. During a period of 5 months, September to January, 4,384 captured female *Anopheles* were identified: of these 1,360 were *A. culicifacies*, 878 *A. fluviatilis*, and 2,146 distributed among 13 other species. The villages were arbitrarily divided into 3 groups, each receiving different dosages of DDT and different intervals between sprayings. Several villages were left unsprayed to serve as controls.

During the year following the DDT application malaria incidence declined in sprayed villages and remained essentially unchanged in unsprayed villages. The spleen indices of sprayed villages fell by more than 50 per cent.

An economic survey was carried out during which families at all economic levels were interrogated and village records were studied. In the sprayed villages there was a decreased expenditure for medical and spiritual care and for funerals; there were fewer days of sickness; sales of land and livestock to meet expenditure were reduced; there was a sharp decline in wages for imported labour to assist in the cultivation and harvesting of rice; some land, formerly fallow for want of labour, was cultivated.

Economic savings during the year following DDT application amounted to more than 70 times the cost of the DDT programme. Norman White

See also p. 990, DI PRIMIO, Recuperação sanitária e elevação do nível econômico da zona malarígena de Tóres [Improvement of Sanitation and Raising the Economic Level in the Malarious Zone of Torres, Brazil].

BRAY, R. S. **The Tissue Phase of Malaria Parasites.** *J. Trop. Med. & Hyg.* 1954, Feb., v. 57, No. 2, 41-5, 2 figs.

In this paper, which was read last year at the meeting of the British Association, the author gives a lucid account of the course, nature, and biological implications of the exoerythrocytic part of the life-cycle of mammalian malaria parasites. As an example he takes the simian parasite, *Plasmodium cynomolgi*, in which the tissue phase has been more fully studied than in any other species parasitic in the Primates. This review does not lend itself to abstracting, but it may be noted that the author has given answers to several disputable points. Thus, there remains little doubt that the EE stages reside within the liver parenchyma cells (but not in the capillaries) and that in the mammalian parasites these stages arise only from sporozoites or EE merozoites (but not from erythrocytic merozoites). Attention is also drawn to the timing of spring relapses, when the invasion of the blood stream by parasites, which had been dormant in the tissues, ensures the infection of the mosquito after it comes out of hibernation.

C. A. Hoare

SHORTT, H. E., BRAY, R. S. & COOPER, W. **Further Notes on the Tissue Stages of Plasmodium cynomolgi.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Mar., v. 48, No. 2, 122-31, 9 figs. (8 coloured) on 2 pls. [11 refs.]

Up to the present, practically nothing was known regarding the exo-erythrocytic development of the malaria parasites of Primates during the first 4 days after inoculation of the sporozoites into the mammalian host. This gap in our knowledge has led to speculations regarding the site in which the initial development takes place, some workers believing that the development in the liver was preceded by stages in the reticulo-endothelial system, as in avian malaria.

To settle these doubts, the authors undertook an experimental study of the earlier stages of pre-erythrocytic schizogony in *Plasmodium cynomolgi*, to supplement the previous studies of the senior author and his associates, which dealt with the schizogony of this parasite in the liver cells from the 5th day onwards [this *Bulletin*, 1948, v. 45, 762].

As previously, the monkeys *Macaca mulatta* were infected by *Anopheles maculipennis atroparvus*. Thousands of these mosquitoes were allowed to bite and their teased-up glands or crushed bodies were inoculated by different routes into the monkeys, after which portions of the liver were removed by biopsy, and examined in fixed and stained sections. In these were found pre-erythrocytic stages 2, 3 and 4 days old, which are described in detail and beautifully illustrated in a set of coloured figures, which show beyond all doubt that all these forms are situated within the parenchyma cells of the liver.

The 2-day forms are minute rounded bodies, 2.3-2.45 μ in diameter, with a single nucleus, in some cases showing signs of division into two. On the 3rd day the parasite measures 4.4-5.9 μ and schizogony is well advanced, with at least 8 nuclei present. Finally, the 4-day schizont has grown to an average of 10 μ in diameter and now contains upwards of 20 nuclei.

The opportunity was taken to study EE development beyond the 12-day stage reported previously. On the 15th day a fully mature schizont was found, measuring 108 μ in diameter and estimated to contain some 60,000 merozoites, and a 17-day-old schizont was seen which was less advanced in

development. These are regarded as "primary" schizonts, i.e., belonging to the cycle initiated by the sporozoites after its invasion of the liver cell.

Finally, in the liver of one of the experimental monkeys, autopsied 105 days after infection, were found 2 late schizonts which are presumably responsible for relapses.

In none of the cases observed was there any evidence of a cellular reaction on the part of the host's tissues.

C. A. Hoare

JASWANT SINGH, NAIR, C. P., RAMAKRISHNAN, S. P. & RAY, A. P. **Studies on Nuri Strain of *P. knowlesi*. I. Effect of Milk Diet on Blood-Induced Infection.** *Indian J. Malariaology.* 1953, Sept., v. 7, No. 3, 253-60, 3 charts. [10 refs.]

Adult rhesus monkeys (9) were inoculated with the Nuri strain [this *Bulletin*, 1954, v. 51, 19, 20] of *Plasmodium knowlesi* before and after being placed on a milk diet (Cowlac dried full cream milk powder 4½ ounces a day); controls (5) were kept on a normal diet. The results were clear-cut: if the monkeys were on a milk diet 7 days before inoculation, no parasites appeared in the blood; if the milk diet was started on the day of inoculation or 15 hours later, parasites appeared in small numbers for 5 or 6 days; if a normal diet was supplemented by milk, parasitaemia was light and the monkey survived though a long chronic infection followed. All the controls died, including 2 which had been subjected to starvation. In none of the experimental animals was the infection completely sterilized, because subinoculations of blood produced infections in the recipients; also return to a normal diet allowed the development of a fatal infection in the group of monkeys which had had milk from the day of inoculation. Splenectomy was without effect on the pre-conditioned animals. Superinfection of a monkey which had been returned to a normal diet gave rise to a fatal infection, indicating that no premunition had developed from the earlier mild attack.

P. C. C. Garnham

BRUCE-CHWATT, L. J. ***Plasmodium berghei* in the Placenta of Mice and Rats: Transmission of Specific Immunity from Mother Rats to Litters.** [Correspondence.] *Nature.* 1954, Feb. 20, v. 173, 353-4.

Though there have been many reports of congenital transmission of malaria parasites, this question is still controversial. In the present paper, the author describes the results of an investigation made on gravid mice and rats infected with *Plasmodium berghei* during the week before parturition. In both groups the litters were free from infection and continued in good health 2-3 months after having been nursed by their mothers.

Examination of the placentae of infected mother rats revealed numerous pigmented parasites in the maternal circulation but none on the foetal side. It is concluded that penetration of the parasites through the haemoendothelial barrier of the placenta must be an exceptional occurrence, due to mechanical or functional deficiency.

Experiments were also carried out on transmission of immunity from mothers to their litter. After female rats recovered from a first infection with *P. berghei* they were re-inoculated with 3-4 weekly intraperitoneal doses of parasites (20-60 million). The rats were then mated, and during the 2nd half of pregnancy were again re-inoculated. The litters of these rats were divided into 3 groups, which were challenged at 2, 3, 4-5 weeks of age respectively. Litters from normal mothers were used as controls.

The results show that young rats born from immune mothers are more tolerant to infection with *P. berghei* than those born from normal mothers.

In another set of experiments, litters nursed by immune and normal rats were interchanged at the age of 3-4 days, and challenged with *P. berghei* at 15 and 30 days in different groups. The results indicated that tolerance to infection is transmitted mainly through the milk of immune mothers: it is evident only towards the end of the nursing period.

C. A. Hoare

THURSTON, June P. **The Chemotherapy of Plasmodium berghei. II.**

Antagonism of the Action of Drugs. *Parasitology.* 1954, May, v. 44, Nos. 1/2, 99-110. [Numerous refs.]

The substances pyrimethamine (Daraprim), proguanil (Paludrine) and certain 2:4-diaminopteridines are known to be folic acid antagonists like the sulphonamides. The action of proguanil on *P. berghei* and on *P. gallinaceum* in slight degree has also been shown to be antagonized by *p*-aminobenzoic acid [this *Bulletin*, 1951, v. 48, 21; 1953, v. 50, 1122]. In the present investigation on *P. berghei* infections in mice an attempt was made to antagonize the action of pyrimethamine, sulphadiazine, proguanil and its active metabolite [*ibid.*, 1952, v. 49, 362] as well as of 3 pteridine derivatives. Mice were inoculated with 1 million erythrocytes parasitized by *P. berghei* and were treated on the day of inoculation and for the next 3 days with drug and antagonist. On the day after treatment ended the degree of parasitaemia was compared in 3 groups of mice, one of which had been treated with drug and antagonist, another with drug alone, while a third group which received no treatment served as control.

It was found that the only substances which antagonized the compounds named above in *P. berghei* infections of mice were *p*-aminobenzoic acid and folic acid (pteroylglutamic acid). No antagonism by certain amino acids, purine or pyrimidine derivatives was detected. Because of the antagonism of these different drugs by the same 2 substances, the author reasonably suggests that they might be expected to act in the same way. In practice, however, their inhibitory effect on plasmodial species varies widely, and possibly involves differences in metabolism of the parasites themselves rather than in the manner in which the drugs are broken down by the host.

J. D. Fulton

ROBERTS, O. Joy. **The Effect of Cortisone on Plasmodium berghei Infections.** *Parasitology.* 1954, May, v. 44, Nos. 1/2, 58-64, 4 figs.

Earlier authors have reported that cortisone aggravates the course of malarial infection in different hosts [this *Bulletin*, 1952, v. 49, 237, 672]. In a report, however, by SCHNEIDER [*ibid.*, 1954, v. 51, 764], he found that cortisone had no appreciable effect on *P. berghei*, *P. gallinaceum* or *P. vivax* infections in their respective hosts. The present author has used 2 strains of *P. berghei* previously maintained by blood passage in hamsters, one much more virulent than the other, to study the effect of cortisone on this infection in mice weighing 20 gm. Infection was by the intraperitoneal route, the drug being given on 3 occasions, spaced as described by FINDLAY and HOWARD [*ibid.*, 1952, v. 49, 672, as referred to above]. The course of infection was followed daily by stained films of tail blood of the host. Further similar experiments were carried out with young hamsters.

It was found that cortisone did not cause a rapid increase in the number of parasites in the peripheral blood of mice or hamsters but rather that it

tended to inhibit the infection in the latter animal. It appeared that this resulted from a limited multiplication of *P. berghei*, fewer merozoites per schizont being formed in the parasites of the hamster than in the mouse.

J. D. Fulton

See also p. 879, NETHERLANDS SOC. TROP. MED. Meeting of October 19th, 1952, in the Institute of Tropical Hygiene and Geographical Pathology, Amsterdam [VAN STEENIS, P. B., Chairman]. **Subtertian Malaria and Shock** [BONEBAKKER, A.].

GARNHAM, P. C. C. **Types of Bat Malaria.** *Riv. di Malariologia.* 1953, Dec., v. 32, Nos. 4/6, 149-54, 5 coloured figs. on pl. [14 refs.]

The author reviews our present knowledge of the malaria parasites of some Old World bats. These parasites are attributed to 4 genera: (1) *Plasmodium*, which is found in tropical African fruit bats (*P. roussetti*), is characterized by schizogony and gametogony in the blood, but EE development is unknown; infection is of the quartan type; (2) *Nycteris*, which occurs in insectivorous bats of Africa and the Far East, produces only gametocytes in the blood, while schizogony is exoerythrocytic in the liver, with schizonts similar to those of *P. falciparum*; (3) *Hepatocystis*: common in fruit bats of the tropical belt; only gametocytes are present in the blood, while EE schizonts develop in the liver in the form of macroscopic merocysts; (4) *Polychromophilus*: widespread among insectivorous bats of Europe; it likewise harbours only gametocytes in the blood, but EE development occurs in reticulo-endothelial cells in which minute schizonts are formed. Very little is known about sporogony in the Haemosporidia of bats.

The paper is illustrated by a plate of coloured figures.

C. A. Hoare

SCHWINK, T. M. **Factors affecting Passive Immunity in Blood-Induced lophurae Malaria of the Chicken.** *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 232-49. [16 refs.]

It was shown [this *Bulletin*, 1941, v. 38, 714] that the serum of chickens recovered from *P. lophurae* infections offered some protection against a similar infection in other hosts of the same species. In view of the work of TODD (*Proc. Roy. Soc., Ser. B*, 1930, v. 106, 20) and the fact that the above infection had been produced by parasitized erythrocytes, the present author was of the opinion that red cell antibodies might be playing a part in the reaction. Investigations bearing on these results by various authors using avian or similar malaria have been reported [this *Bulletin*, 1940, v. 37, 368; 1941, v. 38, 293; 1946, v. 43, 412].

The author (*J. Parasitology*, 1951, v. 37, suppl. 11) studied the rôle of chicken isohaemagglutinins in relation to passive immunity in *P. lophurae* infections. Now *in vitro* and *in vivo* reactions with plasma from immunized and non-immunized chickens have been studied. Plasma obtained from chickens after recovery from *P. lophurae* infections and after intravenous injection with homologous erythrocytes was in some cases frozen and thawed, in other cases heated at 56°C. before conducting the agglutination tests at room temperatures in the presence or absence of added plasma from other chicken donors. A large percentage of the immunized chickens had isohaemagglutinins in their plasma, a rare property in the plasma of normal chickens. The agglutinating power of immunized-chicken plasma was increased by freezing and thawing and to some extent by heating at 56°C.

Chicken iso-agglutinating plasma was effective against parasitized and non-parasitized erythrocytes and the interesting observation was made that absorption with non-parasitized erythrocytes rendered the plasma incapable of agglutinating any cells. Chickens were passively protected against *P. lophurae* infection by plasma from chickens immunized with red cells of the same host species, in the absence of malaria infection. The protection afforded by the plasma of chickens immunized against *P. lophurae* was much less effective.

J. D. Fulton

VEROLINI, F. Sviluppo di forme endoistiocitarie di *Plasmodium gallinaceum* in culture di tessuto splenico prelevato da polli inoculati con sangue in periodo precedente l'invasione endoistiocitaria. [Development of Endohistiocytic Forms of *Plasmodium gallinaceum* in Cultures of Spleen Tissues taken from Chickens inoculated with Blood during the Period preceding an Endohistiocytic Invasion] *Rendiconti Istituto Superiore di Sanità*. Rome. 1953, v. 16, Pts. 7, 8 & 9, 471-9, 8 figs. [13 refs.] English summary.

The object of the experiments described in this paper was to determine whether the blood of fowls infected with *Plasmodium gallinaceum*, when taken before EE forms appeared in their organs, would give rise to tissue forms in fragments of the spleen of the donors *in vitro*. The strain was maintained in fowls by blood passages made on the 3rd day, in the course of the primary attack. During the first 11 days of the infection cultures were put up with spleen fragments, Jacoby's tissue culture technique being used. The results were observed in tissue preparations fixed in Carnoy's fluid and stained by Giemsa's method.

Typical EE forms were found in preparations of the spleen after growth *in vitro* from the 3rd day onwards, but it could not be ascertained whether these forms developed from the erythrocytic stages in the blood, or from EE forms already present in the tissue.

The author uses CORRADETTI's term "endohistiocytic" (*endoistiocitario*) to denote EE development in elements of the reticulo-endothelial system.

The appearance of the EE stages in the cultures is illustrated by photomicrographs.

C. A. Hoare

RAMAKRISHNAN, S. P., BHATNAGAR, V. N., SATYA PRAKASH & MISRA, B. G. Effect of Milk Diet on *Plasmodium gallinaceum* Infection in its Vertebrate and Invertebrate Hosts. *Indian J. Malariology*. 1953, Sept., v. 7, No. 3, 261-5.

Adult fowls were placed on a milk diet (about 36 gm. of dried whole milk) and 2 days later they were inoculated with the blood forms or sporozoites of *Plasmodium gallinaceum*; a control group was kept on a normal diet of isocalorific value and infected in the same way. The resultant infections were compared, and instead of the milk protecting the birds, it actually appeared to cause a more intense parasitaemia which was invariably fatal, while the control birds all recovered. *Aëdes aegypti* mosquitoes were infected with *P. gallinaceum*: half were maintained on 5 per cent. glucose in water and half on 5 per cent. glucose in milk—35 per cent. of the former and 30 per cent. of the latter subsequently developed sporozoites. Gametocytes in birds on a milk diet proved infective to mosquitoes—55 per cent. of which showed sporozoites.

P. C. C. Garnham

BISHOP, Ann. **The Effect of Sulphadiazine, Proguanil and 2:4-Diamino-6:7-Diisopropylpteridine upon Gametocyte Production in Plasmodium gallinaceum (Brumpt, 1935).** Parasitology. 1954, May, v. 44, Nos. 1/2, 120-31. [Numerous refs.]

The author has previously noted a high percentage of gametocytes to asexual forms of *P. gallinaceum* in strains of the parasite made resistant to proguanil and sulphadiazine [this *Bulletin*, 1948, v. 45, 1066; 1950, v. 47, 525] and a corresponding high rate of infectivity of these resistant parasites to mosquitoes. A similar phenomenon appears to occur in huinan malaria when treated with these drugs [*ibid.*, 1946, v. 43, 402; 1948, v. 45, 305; 1951, v. 48, 702]. Investigation has therefore been made with the substances indicated in the title to find if they had a direct effect on gametocyte production in *P. gallinaceum*. All the strains used were derived from a parent strain never previously in contact with drug.

Drug was administered orally to chickens 4 to 10 days old, inoculated intravenously with 50 million parasitized erythrocytes. Comparison was made of the nature of infection in the normal and drug-treated strains when the infection was such that not less than 4 per cent. of erythrocytes were parasitized. Gametocytes which occupied the whole cell and with scattered pigment grains were counted. A marked increase in the proportion of gametocytes to asexual forms was observed during preparation of resistant strains at these times when the parasites were adjusting themselves to an increase in dosage of drug. When resistance to the dosage was complete the ratio of gametocytes to asexual forms decreased.

It was concluded from experimental data that the increase in the number of gametocytes was not due to the direct action of the drug, and no morphological differences in them were noted as the result of drug treatment. In birds treated with drug, exflagellation was unaffected. Whereas the numbers of gametocytes in birds treated with the drugs named in the title increased, treatment with pamaquin (plasmoquine), mepacrine (atebrin), chloroquine or metachloridine, did not significantly alter the relative proportions of gametocytes. The author draws attention to the fact that the drugs producing relatively high gametocyte counts are *p*-aminobenzoic acid or folic acid antagonists. All 3 without effect on gametocyte numbers act on early schizonts and prevent merozoite formation, and an explanation of these findings may depend on the fact that folic acid is concerned in nucleic acid synthesis.

J. D. Fulton

RAY, A. P., MENON, M. K., BHATNAGAR, V. N., NARAYANDAS, M. G. & CHANDRASEKHAR, G. R. **Avian Plasmodium in Indian Birds (*P. polare*).**

Part II. Indian J. Malariology. 1953, Sept., v. 7, No. 3, 249-52, 26 figs. on pl.

A parasite resembling *Plasmodium polare* was found in the blood of 21 partridges (*Francolinus pondicerianus interpositus*) near Delhi [this *Bulletin*, 1954, v. 51, 24]. The species was diagnosed as such because the merozoites numbered between 8 and 16, the schizonts assumed a polar form without displacing the nucleus, and gametocytes were elongate. Fowls were inoculated intravenously with the blood of one infected bird, and they subsequently developed a parasitaemia; when infected fowl blood was passaged to 7-10-day-old chicks, the density of the infection increased and eventually 50 per cent. of the corpuscles became parasitized. Transient infections occurred in ducks. *Aëdes aegypti* was readily infected by the parasite, sporozoites appearing in 8 or 9 days.

P. C. C. Garnham

NATHAN, Helene A. & COWPERTHWAITE, Jean. **Use of the Trypanosomid Flagellate, *Crithidia fasciculata*, for evaluating Antimalarials.** *Proc. Soc. Exper. Biol. & Med.* 1954, Jan., v. 85, No. 1, 117-119, 1 fig. [13 refs.]

Crithidia fasciculata, a parasite of mosquitoes which requires folic acid, has been used in a chemically defined medium whose formula is given, to study the effect of three 2,4-diaminopyrimidines which antagonize folic and folinic acid. Previous experiment had shown that there was a good correlation between *in vitro* inhibition of the crithidial parasite by certain pyrimidines with antimalarial properties and with results of treatment of *P. berghei* and *P. gallinaceum* infections *in vivo*. These results suggested that *C. fasciculata* was a better test object than bacteria for screening of potential antimalarials with anti-folic-acid properties. The optical density of cultures served as a measure of parasite growth when it was being determined as a result of the action of different concentrations of drug in the presence of folic or folinic acid. *C. fasciculata* was competitively inhibited by the 3 pyrimidines tested and the results showed closer correlation with experiments on plasmodia than with those on bacteria, thus confirming earlier work.

J. D. Fulton

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—human, animal; American—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

HUTCHINSON, M. P. **The Epidemiology of Human Trypanosomiasis in British West Africa. III.—Sierra Leone.** *Ann. Trop. Med. & Parasit.* 1954, Mar., v. 48, No. 1, 75-94, 3 maps & 8 figs. on 2 pls. [32 refs.]

This paper is the third in an important series dealing with the epidemiology of human trypanosomiasis in West Africa [this *Bulletin*, 1953, v. 50, 1123]. The first serious outbreak known to occur in Sierra Leone was discovered in 1939 among the Kissi tribe in the extreme east of the territory. Although the Kissi area is unusually densely populated (100 to 127 per square mile) extensive farm clearances are rare since the Kissi economy centres round the oil palm, cattle and pigs. These factors result in intimate and sustained man-fly contact, and when trypanosomiasis was introduced it spread rapidly and caused a high mortality. The source of infection was the Kissi tribe in French Guinea among whom control measures had been necessary since 1932. From there the disease spread westwards into Sierra Leone and Liberia in the same tribe. In the Sierra Leone section of this tribe resistance to infection had been seriously undermined by a series of disasters; pleuropneumonia had killed off their cattle in 1930-31, almost all their pigs had died as a result of an epidemic in 1937, the price of palm kernels had slumped, in 1939-40 the rice crop had failed, and a state of near-famine existed when human trypanosomiasis was spreading in the area. Conditions in the Kissi area are more favourable to *Glossina palpalis* than in other parts of Sierra Leone where the fly is concentrated along the main rivers and is scanty in secondary forest. The

Kissi vegetation is transitional between savannah and secondary forest. The fly is scarce in evergreen thicket or forest and cannot survive in savannah, but tsetse occurs in the transitional zone or where savannah intrudes into thick forest or thicket. The villages, moreover, are situated close to the numerous streams harbouring *G. palpalis* and are surrounded by clearings too small for protection.

The epidemic in Sierra Leone also involved Kono district, separated from Kissi district by an intrusion of French Guinea from which the disease spread across the boundary river and affected those living close to it. Some miles to the west of the river the savannah forming the characteristic vegetation of the area is interrupted by areas of secondary forest or thicket providing conditions for fly-man contact similar to those in the Kissi area. The whole transitional vegetation zone of eastern Sierra Leone became involved in the epidemic. Outward spread was checked by a change of vegetation to secondary forest, by the mountains to the north and west, and by decreased population density.

The epidemic showed some unusual features. Although the clinical condition suggested a low virulence, mortality was high and changes in the cerebrospinal fluid common; the disease evolved rapidly and death occurred before the classical symptoms developed. Where the disease was most rapid the proportion of blood-positive cases was highest. By the end of 1940 the disease in the Kissi area had reverted to the more chronic form common in West Africa. In the Kono focus the disease appeared to be mild but in 1942 around Fuero the incidence remained high in spite of mass treatment which had controlled infection elsewhere. Many of the cases here, as shown by HARDING and HUTCHINSON [this *Bulletin*, 1948, v. 45, 410], were symptomless and without gland enlargement, the ratio of blood-positive to gland-positive cases was 2 to 1 as compared with 1 to 4 or 1 to 5 in other areas, and negative phases in parasitaemia made diagnosis difficult. Nevertheless, 60 per cent. of cases showed an altered cerebrospinal fluid. This strain continued to spread until 1944 and was only checked by mass prophylaxis with pentamidine. Entomological control was not practicable in the epidemic area.

Although the disease is now under control in Sierra Leone conditions remain unaltered, and recrudescence could readily occur if control were to be relaxed in established endemic foci. Successful control requires a concerted attack over the whole epidemic focus, and it is shown that in this outbreak the 3 territories, including French Guinea and Liberia, profited by this. In Liberia control ended in 1944 and this was followed by a rising incidence in Sierra Leone villages close to the boundary, which was checked by pentamidine prophylaxis. Mass survey remains the primary and essential control measure in any new epidemic focus.

In regard to the risk of spread of human trypanosomiasis to other parts of Sierra Leone, in the savannah area of the north only sporadic cases may be expected. In the transitional vegetation of the central belt of the territory conditions on farms near to streams are favourable for close and sustained man-fly contact for much of the year and vigilance will be required, especially where forest is beginning to be broken up. The secondary forest and evergreen thicket of the south is unsuitable for fly, and contact at such fly-infested foci as ferry crossings will not be close and sustained. Farm clearances along the smaller streams may temporarily favour spread of sleeping sickness if it is introduced. In the coastal belt *G. palpalis* is abundant around the inlets and river mouths but man-fly contact is not close and personal and epidemic spread is unlikely though transient outbreaks occur in fishing villages.

It is impossible in a review to do more than indicate the scope of this important paper which should be read in full by those interested.

T. H. Davey

NIGERIA. Sleeping Sickness Service Annual Report, April 1952—March 1953. 7 mimeographed pp., 1 map. [1954.]

More than 1 million people were examined in the year by members of the Sleeping Sickness Service of Nigeria; infection rates were usually under 1 per cent., but in a few places higher rates were found and a serious outbreak involving over 500 cases occurred in part of Kano Province. In some areas (as in Bauchi Province) the incidence was as low as 0·1 per cent., and in part of Kano Province transmission appears to have ceased altogether.

In Plateau Province there is still a potential danger in the mining industry in which over 100 camps, with an annual labour turnover of more than 10,000 men, are scattered throughout 300 square miles of territory. This force is protected by a system of fortnightly examinations and the administration of pentamidine twice each year to those whose homes are in parts of the Province infested by tsetse. No infections were detected in over 9,000 labourers who received pentamidine, in spite of thorough search for cryptic infections.

Tsetse control continues. Much riverine clearing was carried out for control of *Glossina palpalis* and *G. tachinoides*, but half of the tsetse-control staff continued to be engaged on the control of *G. morsitans* in north-east Zaria.

A map shows the areas fully surveyed for sleeping sickness during 1949–1953, and sets out the infection rates in the various districts.

Charles Wilcocks

TRINCAO, C., GOUVEIA, E., FRANCO, A. & PARREIRA, F. La dysprotidémie de la maladie du sommeil. [**Disturbance of Blood Protein in Sleeping Sickness**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 680–85, 1 fig.

The effects of African trypanosomiasis on serum protein have been studied in Africans in Portuguese Guinea. The erythrocyte sedimentation rate was determined and the reactions of Takata-Ara, Takata Ucko, Hanger, MacLagan, Wuhrmann and Wunderly, and of Weltmann were applied. In 15 cases electrophoretic curves were also recorded. These curves differed greatly from those given by normal Europeans and from those of Africans from the same province suffering from anaemia of ankylostomiasis. The albumin was definitely depressed (about half normal); the outstanding feature in the globulins was the height of the γ -peak which was over three times normal, in 9 cases higher than the albumin. The sedimentation rates after 1 hour showed a mean value of 116 mm., higher than those found in anaemia of ankylostomiasis. The colloidal flocculation reactions gave a number of positive results.

These findings led to no definite picture of the changes in blood protein specific for African trypanosomiasis.

J. H. Birkinshaw

GELFAND, M. & ALVES, W. D. **Three Early Cases of Rhodesian Sleeping Sickness treated with Pentamidine Isethionate.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Mar., v. 48, No. 2, 146–9.

The diagnosis in each case was confirmed by finding parasites in the peripheral blood; these were readily established in experimental animals,

where they showed many posterior-nucleated forms; in all 3 cases the cerebrospinal fluid was normal. The first patient was treated with 200 mgm. of the drug intramuscularly daily for 10 days; he responded quickly and appears to be cured. The second was given 400 mgm. of the drug on the first day, 300 mgm. on the second and third days, and then 250 mgm. daily for 6 days; he also responded rapidly and seems to be cured. The third had 300 mgm. of the drug daily for 10 days and the end result was similar.

Antrypol given intravenously is the drug usually recommended for the treatment of such cases, but the treatment extends over 6 to 8 weeks and may result in toxicity, which occasionally is fatal. The advantage of pentamidine is the brevity of the period of treatment and its ease of administration. Provided the patient is kept in bed the risks of toxicity with daily doses of 200 to 300 mgm. of pentamidine are minimal. Provided that there is no evidence of change in the cerebrospinal fluid pentamidine appears to be a good and effective drug in the treatment of early Rhodesian sleeping sickness.

A. R. D. Adams

COSAR, C., DUCROT, R., GAILLIOU, P. & BAGET, J. Étude du sel suramine-pentamidine (4·891 R.P.). [Investigation on the Suramin-Pentamidine Compound] *C. R. Soc. Biol.* 1954, Jan., v. 148, Nos. 1/2, 78-81.

It was shown in animal experiments by GUIMARAES and LOURIE [this *Bulletin*, 1952 v. 49, 126] that concurrent administration of suramin (Bayer 205, antrypol, moranyl) decreases the toxicity of pentamidine (lomidine) and suppresses some of its side effects. The authors have confirmed the earlier work and have shown also in the chloralized dog that mépyramine (néo-antergan), prométhazine (phenergan) and thiazinamium (multergan) do not provoke the hypotension characteristically produced by pentamidine.

They then studied the therapeutic effect of the suramin-pentamidine combination, which contained 45·4 per cent. of the former, 35·7 per cent. of the latter and 18·9 per cent. of water of crystallization, and was only slightly soluble in water. The LD₅₀ for mice after subcutaneous injection in suspension in water lay between 50 and 200 mgm. per 20 gm. mouse. In the rat no deaths resulted with a dosage of 500 mgm. per 100 gm. weight. There was negligible local reaction in rat, mouse or rabbit. Rats of 120 to 150 gm. were treated subcutaneously with the drug mixture and at the end of 1 to 12 weeks were inoculated with 5 million *T. brucei* subcutaneously. The rat blood was examined every 2 to 3 days for 1 month. It was found that the maximal non-lethal dose protected for 17 months and one-thirtieth of this dose for 8 months, whereas the maximum non-lethal dose of pentamidine given alone protected for 1 month. Suramin alone also possesses prophylactic characters.

There is a marked synergism between pentamidine and suramin. The curative action of the combination against *T. brucei* was as great as that of pentamidine in spite of its low solubility.

J. D. Fulton

HOARE, C. A. The Loss of the Kinetoplast in Trypanosomes, with special reference to *Trypanosoma evansi*. *J. Protozoology*. Utica. 1954, Feb., v. 1, No. 1, 28-33, 7 figs. [22 refs.]

In this paper the author brings up to date the history of his akinetoplastid strains of *Trypanosoma evansi* [see this *Bulletin*, 1951, v. 48, 241;

1939, v. 36, 205], and discusses the implications of the loss of this organelle. He stresses that the kinetoplast is not a parabasal body because it does not disintegrate during division, and it is incapable of arising *de novo*; it is more like the plastids of the Phytoflagellates, and like them it is not essential for the existence of the organism. The structure may be mistaken for the basal granule or blepharoplast and for particles of dust. Seven strains of *T. evansi* (6 from camels and 1 from a horse) were studied, and one strain (SAK) has been maintained in mice for 16 years and it is in its 960th passage. This strain and 4 others came from camels in the Sudan and were akinetoplasic from the start (as proved by the examination of 65,000 trypanosomes in strain SAK); the horse strain was normal for about 4 years when it became totally akinetoplasic and remained so for 13 years; a normal camel strain (NS) which eventually showed fluctuating proportions of akinetoplasic forms was also maintained. Sometimes strain NS contained only 1 per cent. of akinetoplasic forms, at other times there were 71 per cent., though today it has reverted to the "normal" again.

Thus, strains may be either (1) totally akinetoplasic arising as such in nature (giving rise to the half-century-old *T. equinum* of the New World) or in the laboratory, or (2) partially akinetoplasic. In the latter case, the abnormal may overgrow completely the normal forms, the opposite may occur, or fluctuating proportions may persist. Similar changes occur in *T. equiperdum* and *T. brucei*. The aberrant pattern arises during irregular division of the trypanosome, one half remains without the organelle and this half continues to breed true. Such organisms may attain a complete ascendancy by (1) chance inoculation of a single abnormal form, and (2) wide fluctuations of abnormal forms may reach 100 per cent. and remain so—because the kinetoplast will not regenerate. An important observation is that the natural occurrence of akinetoplasic trypanosomes is confined to those species which are transmitted mechanically—the phenomenon is absent in all trypanosomes (of the *brucei* group) which are cyclically transmitted. The author concludes that the phenomenon is the result of a mutation, and when the organism becomes isolated, as in the case of *T. equinum*, a new species is formed.

P. C. C. Garnham

TORREALBA, J. F., with the collaboration of B. RICCIARDI, I. RAMOS, A. DÍAZ VÁZQUEZ, J. V. SCORZA, P. A. TORREALBA & J. W. TORREALBA. Nota preliminar sobre un Tripanosoma del grupo *lewisi*, comprobado en el roedor *Dasyprocta rubrata* de Venezuela. [Preliminary Note on a Trypanosome of the *lewisi* Group in the Rodent *Dasyprocta rubrata* in Venezuela] *Gac. Méd. de Caracas*. 1954, Jan.-Feb., v. 61, Nos. 1/2, 37-52, 4 figs. & 6 charts. German summary.

PASSALACQUA, C. de S. P., AMATO NETO, V., ZATZ, I. & DAMASCO, A. Incidência da doença de Chagas entre candidatos a doadores de um banco de sangue de São Paulo. Inquérito sorológico. [Prevalence of Chagas's Disease among Candidates for Blood Donors] *Hospital*. Rio de Janeiro. 1953, Apr., v. 43, No. 4, 443-7.

The English summary appended to the paper is as follows:—

"In 536 prospective blood donors taken at random of the blood bank of the Santa Casa de Misericórdia (São Paulo, Brazil) a serological survey was undertaken through the complement fixation test for the diagnosis of Chagas' disease. The authors found 4·1 per cent of positive results which

were higher than those obtained by other investigators utilizing the same method of study in different blood banks of the same city of São Paulo. The authors think that the reason of the higher rate is due to the fact that the greatest part of individuals examined by them came from the rural zone of the State where Chagas' disease is endemic.

"Other aspects of Chagas' disease related to hemotherapy were also considered."

BIANCALANA, A., DE FREITAS, J. L. P., AMATO NETO, V., NUSSENZWEIG, V. & SONNTAG, Ruth. Investigações sorológicas sobre doença de Chagas entre candidatos a doadores em Bancos de Sangue nos Estados de São Paulo e Minas Gerais. [Serological Findings of Chagas's Disease in Blood Donors] Hospital. Rio de Janeiro. 1953, Dec., v. 44, No. 6, 745-9.

The English summary appended to the paper is as follows:—

"The authors study the incidence of positive complement fixation tests for Chagas' disease among prospective blood donors taken at random in different Blood Banks (Banco de Sangue do Hospital São Francisco, at Ribeirão Preto; Banco de Sangue da Beneficência Portuguesa and Banco de Sangue da Santa Casa de Misericórdia, at Santos; Banco de Sangue de Santa Casa de Misericórdia at São João do Rio Preto and Banco de Sangue at Araguari). The occurrence of positive tests was 21.1%, 0.0%, 0.0%, 14.9% and 19.1%, among 19, 28, 66, 134 and 225 prospective blood donors, respectively. Ribeirão Preto, São José do Rio Preto and Araguari are located in areas where Chagas' disease is endemic."

LEÓN, L. A. & CASTILLO DE LEÓN, Blanca. Trasmisores naturales y experimentales del *Trypanosoma cruzi* en el Ecuador. [Natural and Experimental Transmitters of *T. cruzi* in Ecuador] Rev. Ecuatoriana de Entom. y Parasit. Guayaquil. 1953, Oct., v. 1, No. 4, 45-62, 10 figs. on pl. & 1 map. [27 refs.] English summary.

In Ecuador, the following species of triatomid bug have been found infected with *Trypanosoma cruzi* in nature: *Triatoma dimidiata*, *T. d. capitata*, *Panstrongylus rufotuberculatus* and, only occasionally, *T. carrioni*. *P. geniculatus*, *Rhodnius prolixus* and *R. pictipes* also occur but although natural infection of these occurs elsewhere this has not been observed in Ecuador; nor is there evidence to incriminate *T. dispar*, *T. venosa* or *P. chinai*. Anxiety is expressed for a control programme in Ecuador against vectors of Chagas's disease.

D. S. Bertram

PELLEGRINO, J. Observações sobre a resistência do "Triatoma infestans" ao jejum. [Notes on the Resistance of *Triatoma infestans* to Fasting] Rev. Brasileira Biologia. 1952, Oct., v. 12, No. 3, 317-20.

The English summary appended to the paper is as follows:—

"Observations on the resistance to fasting performed with *T. infestans* larvae of the 3rd and 4th stages gave the following results: 36 (48%) resisted 5 months; 1 resisted 340 days; 2 resisted 323 and 321 days. Five larvae resisted a fasting of over 280 days."

WOOD, S. F. **Environmental Temperature as a Factor in Development of Trypanosoma cruzi in Triatoma protracta.** *Exper. Parasit.* New York. 1954, May, v. 3, No. 3, 227-33. [10 refs.]

"Lower environmental temperatures, 22 to 23°C, retard and higher environmental temperatures, 28 to 34.5°C, increase the number of metacytic *Trypanosoma cruzi* released voluntarily from the enteron of newly infected adult *Triatoma protracta* over the same time interval after initial infection. Metacytic *Trypanosoma cruzi* appeared in feces of *Triatoma protracta* as early as 7 days after an infective blood meal under higher temperatures but were not found as late as 12 days, and in one instance 56 days, under lower temperatures."

PELLEGRINO, J. Técnica para a reação de precipitina no diagnóstico da doença de Chagas com sangue colhido na polpa digital. [**Simplified Technique for Serodiagnosis of Chagas's Disease by Precipitation Test**] Hospital. Rio de Janeiro. 1953, Apr., v. 43, No. 4, 437-41, 2 figs.

The English summary appended to the paper is as follows:—

"A simplified technic for the precipitin test performed with the polysaccharide fraction extracted from culture forms of *Schizotrypanum cruzi* is described."

PICK, F. Sur le "Signe de ROMAÑA". [**On ROMAÑA's Sign**] *Acta Tropica*. Basle. 1954, v. 11, No. 2, 105-38, 20 figs. [57 refs.]

This long article, with copious references to the literature, shows that Chagas in his original description of infection by *Trypanosoma cruzi* noted swelling of the face generally, rather as part of a widespread oedema, and did not observe the unilateral swelling of the eyelids described some years later by ROMAÑA who must, therefore, be given the credit of this as a fresh discovery.

H. Harold Scott

BENCHIMOL, A. B., SCHLESINGER, P. & COTRIM, M. R. A cardiopatia chagásica crônica observada na cidade do Rio de Janeiro. Estudo de 32 casos. [**Cardiopathy in 32 Cases of Chagas's Disease in Rio de Janeiro**] *Med. Cirurg. Farmacia*. 1954, Jan., No. 213, 5-30, 16 figs. [24 refs.]

Chagas's disease is often regarded as largely confined to rural endemic zones, but now that immigration into the towns is on the increase cases are met with there and the present paper gives an account of 32 such patients seen in 8 provinces, namely 15 in 8 towns of Minas Gerais, 6 in 4 towns of Bahia, 4 in 2 towns of Pernambuco, 2 in São Paulo, 2 in Distrito Federal, and one each in Goiás, Estado do Rio and Rio Grande do Sul. The authors state that the diagnosis was confirmed in all cases by the complement-fixation reaction, with cultures of *T. cruzi* as antigen, but in a table they divide the patients into 2 groups, one of 24 (14 males, 10 females) with "diagnosis certain" and one of 8 (6 males, 2 females) with "diagnosis doubtful". Of the former, 19, and of the latter, 6, were in the 2nd, 3rd or 4th decades. These are analysed in various ways clinically, electrocardiographically, the length of time since the patients had moved from the endemic zone, the time elapsing between leaving the zone and the first appearance of symptoms.

The ECG revelations are of interest: 13 had right ramus blockage, complete in 12 (11 permanent, 1 intermittent), 12 had a v-block, 3 each of grades I and II, and 6 total. There was no instance of left ramus block; 7 showed primary changes in the T-wave, 3 of them with a v-blockage; 15 had ventricular extrasystoles, 3 auricular extrasystoles, 1 with paroxysmal tachycardia and 3 with auricular fibrillation.

The paper has 16 X-ray reproductions of the thorax, more than 150 ECG tracings and 5 photomicrographs of the histological changes in the myocardium. It is worth noting that 3 of the patients presented also the condition of megaoesophagus, which, some authors believe, is causally connected with Chagas's disease.

H. Harold Scott

GOBLE, F. C. **Thyroid Changes in Acute Experimental Chagas' Disease in Dogs.** Amer. J. Path. 1954, May-June, v. 30, No. 3, 599-607, 4 figs. on pl. [22 refs.]

Thyroid glands from 17 male and 17 female dogs which died between 25 and 49 days after infection with cultured *T. cruzi* were examined. Changes were found in one male and 12 females (some prepuberal). There was no evidence of invasion of the organ by the trypanosome. The development of abnormality in the gland was thus obviously closely correlated with sex; there was no correlation between the findings in the thyroid and the severity of the trypanosome infection or the presence of lesions in other organs. The author concludes that the origin of the possible thyrotoxic agent was not apparent.

B. G. Maegraith

PIZZI P., T., RUBIO D., Mafalda & KNIERIM T., Feliza. Contribución al conocimiento de los mecanismos inmunitarios en la enfermedad de Chagas experimental de la rata. [On the Mechanism of Immunity in Experimental Infection of Rats with *Trypanosoma cruzi*] Bol. Informaciones Parasitarias Chilenas. 1953, Oct.-Dec., v. 8, No. 4, 66-72, 1 graph. [13 refs.] English summary.

For this investigation the authors made use of 248 laboratory-bred rats, distributed in groups according to age, the material inoculated (whole blood or trypanosomes separated by centrifugation) and route of inoculation (intraperitoneal or subcutaneous). The inoculum was the blood or citrated plasma of dogs infected by a strain of *T. cruzi* of high and constant virulence. For histological study the organs were fixed for 4 to 6 hours in Zenker-formol, then embedded and stained in different ways. Serological studies included precipitin and agglutinin estimations, complement fixation and lytic antibodies and, as antigen, strain "T", a virulent mouse strain.

The results differed in young from those in old animals, i.e. in those over 100 days. In the young adults there was an increase in the circulating parasites reaching a maximum on the 8th day; a crisis occurred on the 9th day and thereafter for a week or so the blood parasites kept low, then rose again between the 16th and 20th days to a higher level than the former, and a final fall by crisis to very low levels. Though this was the rule, there were exceptions; some 11 per cent. showed only one rise and an equal number showed neither the typical rise nor crisis. Intraperitoneal inoculation resulted in a parasitaemia higher than that from subcutaneous inoculation.

In the older animals the curve remained low, with a single rise and no typical crisis.

As regards histological changes, in the young animals the parasites increased locally for 8 days, and on the 3rd day crithidial and trypanosomal forms were set free. On the 9th day, corresponding with the blood crisis, there were observable nuclear pyknosis, karyolysis and karyorrhexis, vacuolation of the cytoplasm and a dark precipitate around the parasite, which increased in size but stained poorly. The cellular parasitism remained intense until the 12th day and then appeared in small groups only. Inflammatory signs appeared from the 3rd day onwards and by the 8th day there were seen small nodules of cells surrounding intra- and extra-cellular leishmanoid forms, becoming fibroid and organized from the 10th day. Leishmanoid forms were present in the myocardium by the 4th day; later a few were seen in the spleen and liver. In the myocardium these leishmanoid forms multiplied and by the 10th to 20th days many of these and some trypanosome forms were set free and many were destroyed about the time of the second crisis.

In the older animals, many of the parasites inoculated were digested; inflammatory reaction appeared earlier, 3rd day, and organization was proceeding by the 8th day. The tissue reactions were similar to those in young animals, but the leishmanoid foci were more abundant and phagocytosis occurred earlier and was more marked.

As for the serological reactions, precipitins were met with at the time of the first crisis and persisted throughout the acute phase; agglutinins also appeared and remained at a high titre up to 4 months after the infection (they were not estimated later than this). Fixation of complement ran the same course as agglutination; lytic antibodies proved irregular.

"Immunological mechanism . . . seems to be fundamentally humoral with secondary phagocytosis of damaged parasites. . . . In old animals, there is an increased immune reaction, which may be mainly explained by phagocytosis and digestion of most of the parasites, in [at] the point of inoculation."

H. Harold Scott

PIZZI P., T., PRAGER S., Ruth & KNIERIM T., Feliza. Ensayos de quimoterapia de la enfermedad de Chagas experimental. XII. Acción de la puromicina sola y asociada a la primaquina. [The Chemotherapy of Experimental Infection with *Trypanosoma cruzi*. XII. The Action of Puromycin alone and in Combination with Primaquine] *Bol. Informaciones Parasitarias Chilenas*. 1953, Oct.-Dec., v. 8, No. 4, 77-9. English summary (9 lines).

Continuing the search for drugs in the treatment of *T. cruzi* infection, the authors have tested a new antibiotic which they call Puromycin, obtained from *Streptomyces alboniger*. This was originally named Achromycin but it was found that this name had been pre-empted. For their experiments they used mice, 70 in all, of about 20 gm. weight. They divided them into 3 groups; to one they gave, simultaneously with inoculation of the parasites the number varying between 480,000 and 600,000, Puromycin, 1-2 mgm. daily for 10 to 13 consecutive days; to a second the same plus primaquine, 0.25 mgm. *per os*; to a third, primaquine alone; a fourth, as controls, received no drugs. The controls all died within 10 or 11 days. Both the drugs had a suppressive action during the acute stage of infection, but did not cure, leaving a "chronic attenuated infection". Suspension of the drugs was not followed by relapse, though after a time a slight tendency to increase of parasitaemia was observed. Tables show

the detailed results, but these may be summed up by saying that primaquine proved a little better than the new antibiotic, Puromycin.

H. Harold Scott

SONNTAG, Ruth & KLOETZEL, Judith. Tratamento da infecção experimental de camundongos pelo *Trypanosoma cruzi*, com Achromicina. [Achromycin in the Treatment of Camundongos experimentally infected with *Trypanosoma cruzi*] *Folia Clin. et Biol.* S. Paulo. 1953, Sept., v. 20, No. 2, 133-8.

Achromycin [Puromycin], an antibiotic obtained from *Streptomyces albo-niger*, and its use in infection of camundongos and rabbits with *T. equiperdum* and its action *in vitro* and *in vivo* on *T. cruzi* were recorded by HEWITT *et al.* in 1953 [this *Bulletin*, 1953, v. 50, 690]. The authors of the present paper used higher doses of achromycin than did Hewitt *et al.* without causing any signs of intolerance. Their method has been to give intraperitoneally to white camundongos, 20-30 days old and weighing 10-15 gm., 0.2 ml. of infected blood obtained from the heart blood of other camundongos infected with the Y strain (a human strain) of *T. cruzi* which had been maintained for 3 years in the laboratory by successive inoculations of camundongos. The achromycin was injected intraperitoneally in daily doses of 80 mgm./kgm. for 15 days, the total dosage being 1,200 mgm./kgm. The animals were divided into 2 groups after primary inoculation of the infected blood; one was given the antibiotic a few hours after, the other when the parasitaemia had reached a high level. Controls were kept under observation in each case. Blood was taken from the tails; the number of trypanosomes was counted in 50 fields at a magnification of 400 at the start of the inoculation and on alternate days thereafter, so as to obtain curves of those treated and of the controls. Any that survived for 2 months were killed and histological examination of the tissues carried out.

The achromycin was used in a strength of 1 per cent. in physiological saline. The results are presented in tables showing the numbers of animals injected in each experiment, the estimated number of trypanosomes injected, the maximum level of parasitaemia and the length of survival in days of each of the animals. It was found that those which lived for more than 30 days became chronic carriers of the infection, with a low parasitaemia.

For the more intimate details these tables should be consulted, but the results may be thus summarized: Of 30 animals given the achromycin from the day of inoculation of the infective blood 17 lived to become chronic carriers whereas of 15 control animals only 1 survived. Among the 36 which were given the antibiotic later, when their parasitaemia was high, the results varied. The degree of parasitaemia was generally lower, as shown by the curve, but the length of time of survival appeared not to be affected, death occurring in 6 days, owing to intense tissue changes. The authors conclude that further trial of achromycin is warranted in human cases of Chagas's disease [provided, presumably, that treatment is begun early].

H. Harold Scott

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

KOSTIĆ, D. [Blood Meal of Sandflies (*Phlebotominae*) in Serbia—Dobrlicki County] *Glas Srpske Akademije Nauka; Odeljenje Medicinskih Nauka. Belgrade. 1951, v. 204 (n.s.), No. 4, 61–6.* [In Serbian.]

The English summary appended to the paper is as follows:—

“With the aim to help enlighten the question of epidemiology of Kala-azar and an attempt to establish an epidemiology link between *Phlebotomus* species, source of their blood meal and distribution of Kala-azar, we have examined 454 female sandflies. Only those with well-filled stomachs were caught early in the morning within human dwellings as well as outside of stables, cellars, latrines, sheds, churches, etc. The work was conducted in Dobrlicki county comprising 11 villages with a population of about 6000.

“The species of *Phlebotominae* we have found were: *P. papatasi* Scopoli; *P. major* Annandale; *P. chinensis* var. *simici*, Nitzulescu; and *P. perfiliewi* Parrot. The most abundant were *P. papatasi* and *P. perfiliewi* and the rarest (only 12) *P. major*.

“As regards the source of their blood meal we see that *P. papatasi* partakes mainly human blood (over 60%), *P. perfiliewi* also human blood (over 70%), while the other species mostly animal blood (dogs, horses, cattle, pigs and sheep). The percentage of blood within sandflies caught in human dwellings is somewhat smaller. In 24 out of 460 sandflies we could not determine the source of blood and we supposed it might be that of birds, reptiles and small rodents.

“An important part of our work was devoted to preparation of specific precipitin antisera. Sandflies, as is known, contain small quantities of blood and for exact work only high titer antisera may come into consideration. These sera must be strictly specific, inasmuch as closely related animals are in question (horse-mule, sheep-goat, cow-buffalo).

“In preparing our antisera we have abundantly profited by the experiences of H. Proom (B. Wellcome labs. 1943) as well as from other authors. The rabbits were injected intramuscularly with an alum precipitated serum and thus we obtained potent and highly specific antisera with a titer reaching up to 16,000.

“As regards the technique in performing precipitin tests, we have obtained best results by the ring method, using small test tubes (3 × 50 mm.). The readings were done immediately and then every 10 minutes during the first hour. After a lapse of 2 hours all reactions were disregarded. With each series, control tests were performed with antigens and antisera.

“We regard our work to be of a preliminary character and it has a more local significance. Similar work conducted over a wider range and with a greater number of sandflies would give us more data and more satisfactory results.”

FLOCHE, H. & SUREAU, P. Notes sur la réaction universelle de Kahn. Sa négativité dans la leishmaniose forestière américaine. [Observations on the Kahn Universal Reaction. Negative Reaction in Mucocutaneous Leishmaniasis] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 280. 1953, Apr., 11 pp., 3 figs.*

With the ordinary technique of the Kahn reaction “false positives” sometimes occur in conditions such as leprosy and malaria that are common

in the tropics. The universal Kahn reaction was devised to differentiate the results obtained in these conditions from that in either syphilis or yaws. The antigen solution used is the same as that used in the Kahn test, but it is used undiluted and in 6 dilutions, 1 in 2, 1 in 4, 1 in 8, 1 in 16, 1 in 64 and 1 in 256, and, for each of these, 6 different strengths of saline and one without saline are used, so that altogether 49 tubes are put up; the strengths of saline are 0·15, 0·6, 0·9, 1·2, 1·8 and 2·1 per cent. One reading is taken immediately, one after 4 hours' and one after 24 hours' incubation at 4°C. At least 2 plus is considered a positive reaction.

The results are presented in the form of graphs, 3 graphs for each sample. The reaction varies in different persons but is normally constant for one person. The authors report the typical results that are obtained in syphilis, yaws, leprosy, tuberculosis and malaria. In syphilis, precipitation occurs in all concentrations of saline, but in the higher dilutions of the antigen and the middle saline concentrations (0·6 per cent., 0·9 per cent. and 1·2 per cent.) it is less marked and there is little or no change after incubation. In yaws the picture is the same but precipitation is less marked. In leprosy, the precipitation is most marked in the lower saline dilutions and increases after incubation. In malaria, precipitation is increased during an attack and returns to normal after cure, and in tuberculosis the result is similarly affected by the state of activity of the disease.

A series of tests was carried out in forest [mucocutaneous] leishmaniasis.

Of 12 cases in which *Leishmania brasiliensis* was found 9 showed a negative result with practically no precipitation except in the extreme saline dilutions, and in 2 the picture was suggestive of syphilis or yaws and could be classed as positive. In one case a weak positive reaction was obtained. Thus, as only 17 per cent. gave a positive reaction, which is not as high as the percentage obtained in the normal population, the test is of no diagnostic value in this disease. Further mucocutaneous leishmaniasis is unlikely to be the cause of "false positives" in the diagnosis of syphilis and yaws.

L. E. Napier

MUNIZ, J. Contribuição ao estudo da leishmaniose cutâneo mucosa (Espundia). [On Mucocutaneous Leishmaniasis] Hospital. Rio de Janeiro. 1953, Jan., v. 43, No. 1, 1-13, 16 figs. English summary,

This is a description of a case of extensive facial mucocutaneous leishmaniasis in a Bolivian, Rufino Calle—hence called throughout this paper the Calle case—studied at the Protozoological Section of the Oswaldo Cruz Institute. A photograph of the patient shows a terrible condition of fungoid growth of the face, nose, lips and ears, thought at first to be a leishmaniasis associated with chromoblastomycosis. For comparison, reference is made to Nery GUIMARÃES's case and experimental work on a leishmanoid histiocytoma [this Bulletin, 1952, v. 49, 1105; see also *ibid.*, 1948, v. 45, 508]. Experimental work with hamsters, *Cricetus auratus*, showed it to cause systemic invasion, though the strain isolated by Guimarães did not. Photographs of the tissues of the patient and of the hamsters depict well the histological changes, but the paper is largely taken up with a discussion whether this is a new or special strain of *Leishmania brasiliensis*. The older idea that *L. tropica* was distinguishable fundamentally from *L. brasiliensis* by the fact that the latter did not cause systemic reaction no longer holds good. If the species or varieties are to be distinguished this must be on some different basis. [An interesting paper, especially for the systematist.]

H. Harold Scott

PFEIFER, E. Beitrag zur Therapie der Espundia. [Treatment of Espundia] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Apr., v. 5, No. 2, 184-7. [10 refs.]

The English summary appended to the paper is as follows:—

"Cutaneous leishmaniasis mainly affecting the nose was seen in a man who had lived for 25 years in the interior of Brazil. He was treated with fuadin and neosalvarsan injections, berberin swabs of the nasal mucosa and local infiltrations of an atebrin-hyaluronidase solution. Treatment led to a complete cure."

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

LE GAC, P. & GIROUD, P. La fièvre rouge congolaise, forme exanthématique de la fièvre Q? [Is Congolese Red Fever an Exanthematic Form of Q Fever?] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 976-83, 4 figs. on 3 pls.

The authors are not prepared to accept the opinion of the experts of the WHO who regard the name *fièvre rouge congolaise* as having been given to a number of different diseases and as being ripe for abolition [this *Bulletin*, 1951, v. 48, 351]. They believe that the name can rightly be given to the "clinical entity" described by CLAPIER under this title in 1921. The clinical description of the disease given by the authors strongly suggests dengue except that they mention the occurrence in some severe attacks of a "leucocytosis of variable importance, with a predominance of monocytes" [abstracter's translation]. They seem, however, to regard the disease as a form of tick-borne typhus, differing from the boutonneuse type in never having an inoculation eschar. Three cases of this clinical type have been investigated and from each of them a strain of *Rickettsia burneti* has been isolated from the blood of the patients by a series of passages through guineapigs by the intraperitoneal route. From the guineapigs transfers were made to white rats, monkeys and white mice. Sera of the monkeys agglutinated the homologous strain at a titre of 1 in 160 and the Nine Mile strain at 1 in 80. Serum of a rabbit inoculated intradermally with a strain later agglutinated the same strain at 1 in 160 and the Nine Mile strain at 1 in 40. Serum of another rabbit inoculated intraperitoneally agglutinated the homologous strain and the Nine Mile strain at 1 in 640; it also agglutinated *R. conori* at 1 in 80, *R. prowazeki* at 1 in 20 and *R. mooseri* at 1 in 40. Microagglutination tests of sera of 10 patients on the 18th to the 35th days of the illness gave 4 reactions at 1 in 20; 4 reactions at 1 in 40 and 2 at 1 in 80.

Sera of certain patients were inoculated into guineapigs whose sera agglutinated the organisms at titres of 1 in 10 to 1 in 160. Intradermal hypersensitivity tests of 9 patients less than 6 months after their attacks were positive with the antigen; 4 other patients gave negative reactions a year after the illness.

The conclusion reached was that Congolese red fever is an exanthematic form of Q fever. An epidemiological investigation resulted in suspicion

being directed to *Simulium damnosum* and *Culicoides grahami* as the probable vectors.

In the discussion after the reading of the paper Dr. PELLISSIER objected to the proposal to give the name of Congolese red fever to a form of Q fever or to any other disease whose causative agent has been discovered; these diseases ought to be called by their true names, otherwise nothing but confusion will result. [This view will probably find widespread support, and so will the opinion of the WHO experts that the name Congolese red fever has outlived any usefulness it may have had.]

John W. D. Megaw

GIROUD, P. & JADIN, J. Comportement des animaux domestiques au Ruanda-Urundi (Congo belge) vis-à-vis de l'antigène épidémique. [Responses of Domestic Animals of Ruanda-Urundi (Belgian Congo) to the Antigen of Epidemic Typhus] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 870-71.

In March and April 1950, the authors carried out rickettsiae-agglutination tests, and in some cases also complement-fixation tests, with epidemic typhus antigen on various domestic animals in Ruanda-Urundi. Reactions at titres of 1 in 80 or over were observed among the following animals. (1) Among 26 cattle 6 were positive at 1 in 80 and 1 at 1 in 320. Only 1 of the 10 animals tested by the complement-fixation reaction gave a positive reaction which was at 1 in 10. (2) Among 24 sheep 2 were positive at 1 in 320; none of the 5 sheep tested by the complement-fixation reaction gave a positive result. (3) Among 12 goats 2 were positive at 1 in 80 and 7 at 1 in 160. With the fixation test the 4 goats examined were positive at 1 in 40 to 1 in 640. (4) Among 17 pigs 6 reacted at 1 in 80, 5 at 1 in 160 and 1 at 1 in 320. (5) Among 10 dogs 3 reacted at 1 in 80 to 1 in 320. (6) Among 10 horses 8 were positive at 1 in 80 to 1 in 640. With the fixation test 1 of the 7 examined reacted at 1 in 20.

Attempts were made, without success, to isolate strains of rickettsiae from the animals. The authors state that the question arises whether the animals are reservoirs of epidemic typhus or of some other major rickettsial disease or whether they are harbouring infection of the ticks which swarm in enormous numbers among the animals of the area.

[Sceptics may suggest that the findings indicate the need for further investigation into the specificity of the tests.]

John W. D. Megaw

RUPE, C. E., MARVEL, H. R., RYAN, R. J. & QUINN, E. L. **Typhus Fever (Brill's Disease) complicated by Diabetes Insipidus.** Report of a Case. *J. Amer. Med. Ass.* 1954, May 29, v. 155, No. 5, 433-5, 3 figs. [Refs. in footnotes.]

This is a detailed description of a case of typhus fever of the Brill type which occurred in Detroit in April 1953. The patient was a man aged 51 who was born in Turkey where at the age of 14 he had an attack of typhus fever. He had lived in Detroit since 1916. The illness described was clinically typical of a moderately severe attack of exanthematic typhus in which the fever lasted 14 days. No evidence could be found of any exposure to recent risk of infection.

The complement-fixation test with *Rickettsia prowazekii* antigen was positive at 1 in 640 on the 7th day and at 1 in 2,560 or over on the 19th and 29th days. With *R. mooseri* antigen the titre was 1 in 20 on the 7th day, and 1 in 640 on the 19th and 29th days.

The reactions with the Weil-Felix test were anomalous; with *Proteus OX2* they were completely negative; with *Pr. OX19* the titre was 1 in 20 on the 7th day, there were negative reactions on the 14th and 19th days and a titre of 1 in 80 on the 21st day. With *Pr. OXK* the reactions were negative on the 7th day; positive at 1 in 80 on the 14th day, at 1 in 160 on the 19th day, and at 1 in 320 on the 21st day.

An unusual feature was the occurrence of transient diabetes insipidus. The output of urine rose rapidly reaching 11,900 cc. on the 14th day and remained very high for 6 days, after which it fluctuated capriciously between 1,500 cc. and 5,000 cc. till the 31st day when the patient was discharged from hospital.

John W. D. Megaw

RUIZ SÁNCHEZ, F., RUIZ SÁNCHEZ, A., BECERRA, A. & NARANJO GRANDA, E.
Treatment of Exanthematic Typhus with Tetracycline. *Antibiotics & Chemotherapy.* New York. 1954, Apr., v. 4, No. 4, 402-5, 1 fig.

Chlortetracycline (whose trade name is Aureomycin) is recognized as being one of the most useful drugs in the treatment of typhus fevers. Lederle Laboratories who discovered the drug have now produced from it a new antibiotic, tetracycline, by elimination of the chlorine atom. They have adopted the trade name Achromycin.

The authors describe the treatment of 6 typhus fever patients, aged 14 to 46 years, with the new drug in daily doses of 2 to 3 gm. for 3½ to 4½ days. In 4 cases the treatment was started on the 6th or 7th day; in the other 2 it was started on the 9th and 11th days respectively. In every case the symptoms subsided rapidly and no signs of toxicity or intolerance were observed.

John W. D. Megaw

PARKER, F., Jr. & NEVA, F. A. **Studies on the Toxicity of Typhus Rickettsiae. II. Pathologic Findings in White Rats and White Mice.** *Amer. J. Path.* 1954, Mar.-Apr., v. 30, No. 2, 215-37, 12 figs. on 7 pls. [21 refs.]

The authors describe the pathological changes that are produced in white rats and mice by intravenous injections of yolk-sac cultures of *Rickettsia prowazekii* and *R. rickettsii*. After doses lethal within 6 hours the gross changes in white rats were great engorgement of the visceral blood vessels, and the mucosa of the middle part of the small intestine was haemorrhagic. After doses lethal within 10-18 hours gross abnormalities were unusual. Pronounced microscopical changes were found in the intestines, lungs and livers of rats dying 6 hours after injections. There were accumulations of polymorphonuclear leucocytes in the capillaries of the lungs, and the Kupffer cells of the liver contained numerous polymorphs which had been engulfed by phagocytosis. In white mice the only definite microscopic changes after highly toxic doses were in the liver where they were the same as those seen among white rats.

Sublethal toxic doses caused prominent changes in the livers of rats and mice; these were foci of necrosis of the liver cells which, however, were restored to normal by the 5th day so that the damage was attributed to the toxins rather than to the multiplication of the rickettsiae.

The changes observed in rats and mice resembled those described by various authors as occurring in animals after intravenous injections of influenza virus.

The descriptions are illustrated by 2 photographs of the affected intestines and by 9 clear photomicrographs of sections of the intestine and liver.

John W. D. Megaw

PRATT, H. D. & GOOD, N. E. **Distribution of some Common Domestic Rat Ectoparasites in the United States.** *J. Parasitology.* 1954, Apr., v. 40, No. 2, 113-29, 12 figs. [Numerous refs.]

The known geographical distribution of all the common ectoparasites of domestic rats in the U.S.A. is described briefly and references are given in the bibliography to 86 different sources of information which have been consulted. In the parts of the U.S.A. from which cases of murine typhus have been reported the survey of these parasites has been exceptionally thorough because it formed part of a programme for the control of the vectors of this disease by DDT. This programme, which included measures for the control of domestic rats, was started in 1944 and has been remarkably successful. In 1944 the number of reported cases of murine typhus was 5,401; from 1945 onwards there was a rapid progressive decline so that in 1952 only 186 cases were reported.

Ten outline maps of the U.S.A. show the distribution of (1) *Xenopsylla cheopis*, the oriental rat flea; (2) *Nosopsyllus fasciatus*, the northern rat flea; (3) *Echidnophaga gallinacea*, the sticktight flea; (4) *Leptopsylla segnis*, the mouse flea; (5) *Polyplax spinulosa*, the spiny rat louse; (6) *Hoplopleura oenomydis*, the tropical rat louse; (7) *Bdellonyssus bacoti*, the tropical rat mite; (8) *Laelaps echidninus*, the spiny rat mite; (9) *Laelaps nuttalli*, the domestic rat mite; and (10) *Haemolaelaps glasgowi*, the common rodent mite. On the last map there is also shown the distribution of *Allodermanyssus sanguineus*, the house-mouse mite, which though recorded only from a few places is of special interest as being the proved vector of rickettsialpox.

John W. D. Megaw

OKAMOTO, K., UEDA, S., CHIKASATO, Y. & SUKEGAWA, N. **A Survey of Rat and Rat-Flea in the Port Area of Yokohama City.** *Japanese J. Med. Sci. & Biol.* 1953, Dec., v. 6, No. 6, 633-9, 2 figs.

"On the basis of the observations during the survey from April 1952 to March 1953 the following was considered;

"1. Though the rats activity in the port area of Yokohama is less than in the dwellings (in Tokyo), in regard to the speciality of the circumstances, a constant deratting and survey should be enforced in the port area of Yokohama.

"2. The number of *Rattus norvegicus norvegicus* captured was larger than that of *Rattus rattus alexandrinus*. However, R.r.a. have increased in ratio against the other.

"3. The number of rats captured was larger in April and in September to November than in the other months. Females of R.r.a. seem to be active in the spring time, those of R.n.n. in the summer time.

"4. Not a single individual of *Xenopsylla cheopis* was found in the period of the present survey. The most of the rat-fleas captured were *Ceratophylli*, very few were *Leptopsylla musculi*. The number of females of *Cerat. fasciatus* was as large as almost twice of that of males. They seem to be very active in April. The numbers of females and males of *Cerat. anisus* differed not much."

KARP, Adele. An Immunological Purification of Typhus Rickettsiae. *J. Bacteriology*. 1954, Apr., v. 67, No. 4, 450-55. [17 refs.]

The author describes a study of the difficult problem of the metabolic processes that occur in rickettsiae which live inside the cells of their hosts. The organism studied was the Wilmington strain of *Rickettsia mooseri* which was cultivated in yolk sacs, suspensions of which were treated with celite and albumin to free them from extraneous material. The rickettsiae purified in this way were found to have esterase, adenosine-triphosphate and catalase activities and to be capable of oxidizing glutamate. When the suspensions were treated with the serum of rabbits which had been immunized against uninfected yolk-sac material, part of the protein in the suspensions was agglutinated and the greater part of the first 3 of the above properties was removed whereas the power of oxidizing glutamate was only slightly reduced, and this power was regarded as the only enzyme activity originating in the rickettsiae; the others were regarded as being due to contamination of the rickettsiae with host material which is rich in enzymatic activities.

Suspensions of the infected lungs of white mice of the 4th passage of inoculation by the intranasal route were found to contain enough rickettsiae for study of their metabolic activities; they were treated in the same way as the yolk-sac suspensions and were found to oxidize glutamate. This finding is further evidence that the power of oxidizing glutamate is a characteristic property of rickettsiae.

John W. D. Megaw

WHITMIRE, Carrie E. & DOWNS, Cora M. Effect of Cortisone on Experimental Murine Typhus in Mice. *Science*. 1954, Apr. 9, v. 119, 468-9.

The authors found that the susceptibility of mice to murine typhus infection was greatly increased by the subcutaneous injection of as little as 0.625 mgm. of cortisone 4 to 24 hours before inoculation with the rickettsiae. Different strains of mice showed great variation in their susceptibility to the effects of cortisone; for example with doses of 1.25 mgm. white mice became 7 times as susceptible as untreated control mice, whereas mice of the strain NHF_s became 40 times as susceptible. Mice of the dba strain became approximately as susceptible as did white mice when the dosage was 1.25 or 2.5 mgm.

The authors conclude that by using cortisone-treated mice more rapid diagnosis of typhus infections will be possible and that experimental murine typhus infections could be more readily studied. Smaller numbers of rickettsiae caused the death of NHF_s and dba mice than of white mice after cortisone treatment so that the use of these strains of mice would be valuable in studies in which *R. mooseri* are used.

John W. D. Megaw

MOHR, C. O. Notes on Chiggers, Rats and Habitats on New Guinea and Luzon. Reprinted from *Ecology*. 1947, Apr., v. 28, No. 2, 194-9, 2 figs.

The author gives an account of a study made in New Guinea and the Philippines, prompted by the outbreak of scrub typhus among American troops occupying these two areas at the close of the late war.

The areas investigated are described; in each case these consisted of neglected native gardens and plantations cleared from the edge of jungle, and reverting back to a semi-wild state as a result of wartime conditions.

Wild rodents were trapped, alive and dead, and examined for chiggers

[Trombiculid mites], and allotted an "infestation index" based on the approximate number and distribution of the attached larvae in the folds of the ear. This index was used to compare the relative chigger populations in different ecological zones, as a result of which it was concluded that the mite populations were larger in zones with a dense vegetative cover than in areas with a less dense cover. Two common rats present in New Guinea are the jungle rat, *Rattus ringens*, and the Malay rat, *R. exulans* (= *concolor*); the former occur in abundance in a greater range of habitats, from dense jungle via scrub to almost pure stands of grass, whereas the Malay rats are confined to scrub and grass. Where both rats occurred in the same habitat the jungle rats tended to harbour more mites than the Malay rats.

Consideration of the habitat zones in which various species of mite were found showed that *Trombicula deliensis* and *Walchia disparunquis* occurred over a wide range of habitats, from dense, undisturbed jungle to banana gardens; whereas *Trombicula akamushi* was found only in the more open zones of grassy scrub. *T. deliensis* was the most common of the chiggers found, particularly on the jungle rats.

D. M. Minter

GIROUD, P., LE GAC, P. & ROGER, F. Au sujet des rickettsies du groupe boutonneux-pourpré et de l'agent du typhus à tiques de Sibérie. [The Rickettsiae of the Boutonneuse-Spotted-Fever Group and the Causative Agent of Siberian Tick Typhus] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 866-70.

The authors discuss the unexpected findings by American workers, T. T. CROCKER and 6 others, who in 1950 studied strains said to be from cases of Siberian tick typhus and found them to be related to epidemic typhus rickettsiae rather than to *Rickettsia conori* [this *Bulletin*, 1950, v. 47, 617]. The question arose whether *R. prowazeki* might not be capable of transmission through the tick-rodent cycle. The authors mention that they had found in 1947-48 definite agglutination of *R. prowazeki* by sera of cases of boutonneuse fever and had called attention to the serological relationship between this disease and epidemic typhus fever. In 10 out of 12 cases of boutonneuse fever strong rickettsia-agglutination reactions were given with *R. prowazeki*; in 6 of the cases the titres were 1 in 320 to 1 in 1,280. There was also agglutination of *R. conori*, sometimes at a much higher titre than with *R. prowazeki*. They also refer to the pronounced changes, including loss of virulence, that they have observed in numerous strains of *R. conori* during passage through guineapigs. When the organisms were passaged through the lungs of mice considerable morphological changes occurred; the rickettsiae became bacilliform, resembling *R. mooseri*, and ceased to multiply within the nuclei of the host cells and also became agglutinable at the same titre as *R. mooseri*. They suggest that the Russian strains of tick typhus had undergone similar changes and that the mutation had been promoted by their having been sent in the form of desiccated infected lung and by passage through guineapigs after arrival in the U.S.A. Strains sent in infected ticks would have retained their original characteristics.

John W. D. Megaw

GOULD, D. J. & MIESSE, Marie L. Recovery of a *Rickettsia* of the Spotted Fever Group from *Microtus pennsylvanicus* from Virginia. *Proc. Soc. Exper. Biol. & Med.* 1954, Apr., v. 85, No. 4, 558-61. [13 refs.]

The authors report the first definitely confirmed isolation of a strain of *Rickettsia rickettsi* from a naturally infected wild animal in the United

States. The strain was recovered from one of 65 meadow mice (*Microtus pennsylvanicus*) collected from an area in Virginia where patients suffering from Rocky Mountain spotted fever were believed to have recently contracted their infection. The other 64 mice and 40 small animals of different species were not infected. The strain was passed through 15 successive guineapigs; in the later passages some of the guineapigs developed a mild scrotal reaction; sera of convalescent guineapigs reacted to the complement-fixation test for *R. rickettsi* infection at titres of 1 in 40 to 1 in 160 but did not react with *Rickettsia akari* antigen which usually gives the same reactions as *R. rickettsi*. Cross-fixation tests and cross-immunity tests on guineapigs confirmed the identification of the organism. The infected mouse and 6 other mice harboured *Dermacentor variabilis*, which is the principal vector of Rocky Mountain spotted fever in the eastern half of the United States. The authors point out that their findings do not necessarily indicate the actual presence of infection among the meadow mice.

John W. D. Megaw

MARMION, B. P., STEWART, J., RICHMOND, P., BARBER, H. & STOKER, M. G. P.
Q Fever in Great Britain. Sheep as a Source of Infection for Man.
Lancet. 1954, June 19, 1288-91, 1 fig. [12 refs.]

In Kent the number of reported cases of Q fever has been larger than in the eastern counties of England [this *Bulletin*, 1953, v. 50, 501]. So also blood donors from Kent have yielded 3·29 per cent. of complement-fixation reactions at titres of 1 in 10 or over with *Rickettsia burneti* antigens against 0·8 per cent. of reactions among blood donors from the eastern counties. Tests of samples of cows' milk in Kent showed that 8·2 per cent. of the herds were infected as compared with 0·24 per cent. of the herds in the other counties. The present study was directed to finding whether sheep played a part in causing the higher rate of prevalence in Kent where their numbers were far greater than in the other counties—65·9 against 6·1 per 100 acres of crops and grass. The area selected was the Romney Marsh, in which there were about 287 sheep per 100 acres and only about 10 cattle per 100 acres. The population of the area is 9,247 and is concentrated mostly in 5 small towns so that in the rural part it is sparsely distributed over about 48·4 square miles.

The first step was to examine the sera of 62 persons who had been notified as having suffered from "pneumonia" or an unexplained febrile illness in 1949-1953; 10 of these (16 per cent.) were found to give positive complement-fixation reactions for Q fever at titres of 1 in 40 or over and 17 others reacted at titres of 1 in 5 to 1 in 20. Among 100 healthy controls there was only one reaction at 1 in 40 but there were 23 at 1 in 5 to 1 in 20. The illnesses of the 10 persons of the test group who reacted at 1 in 40 or over were found to have occurred between the middle of March and the middle of June; this is the period of lambing and shearing. In addition to these cases there was an outbreak of 10 cases, diagnosed retrospectively as Q fever, in which the persons affected belonged to a troupe of actors who performed in a religious play in a small village in the Marsh during the lambing season. In a flock of 95 sheep close to this village 33·7 per cent. of the sera reacted at titres of 1 in 10 to 1 in 80, and in a house close to the field in which this flock had lambed another person was attacked subsequently. The shepherd of a flock of 143 sheep on an isolated farm was attacked with confirmed Q fever about 20 days after the height of the lambing season, and 7·7 per cent. of the sheep gave positive reactions. In another farm two of the workers were attacked during the lambing season and 4·3 per cent. of the sheep on this farm were found to be positive.

The percentage of reactions among 906 sheep at slaughter-houses in Kent was 1·6. The cautious comment of the authors is "some evidence is presented that infection of sheep is responsible for infection of man in this area".

John W. D. Megaw

TAYLOR, R. M., HASSAN, F. R. & KADER, M. A., with the technical assistance of C. P. A. STROME. **Q Fever in Egypt as revealed by the Complement Fixation Test on Human Sera.** (A Preliminary Report.) *J. Egyptian Pub. Health Ass.* 1952, v. 27, No. 4, 129-40.

In a preliminary survey by the complement-fixation test for Q fever evidence of the widespread occurrence of the disease was found in Cairo, Aswan and 7 different villages situated in 5 provinces of Egypt. Among 403 males of all ages 22 per cent. were found positive at titres of 1 in 8 to 1 in 64 or over; among 319 females 33 per cent. were positive. The highest incidence was in the age group 0 to 4 in which 37·5 per cent. of males and 52 per cent. of females were positive; in the 5 to 19 age group the corresponding figures were 21 and 25·5 per cent.; among persons of 20 years and over the figures were 15 per cent. for males and 25 per cent. for females.

Among 8 infants aged 4 to 6 months only one reacted; the titre was 1 in 16, and 4 months later it had risen to 1 in 32. Among 70 children under the age of 5 years who were tested twice the first test gave 41 positive reactions and the second, 3 to 4 months later, gave 8 further positive reactions among the 29 children who were originally negative; 7 of these 8 were less than one year old when first tested.

In one village sera of 26 sheep were tested and 16 were positive; of 25 goats in the same village 15 were positive.

The high infection rate among very young children contrasts with the findings in the U.S.A. where the rate increases with age. The higher rate among females may be associated with the customs prevailing in Egyptian villages, such as living under the same roof as the domestic animals.

John W. D. Megaw

URBACH, H. & SPRÖSSIG, M. Die fluoreszenzmikroskopische Darstellung der *Rickettsia burneti* und ihre photographische Wiedergabe. [Fluorescence Microscopy in the Demonstration and Photomicrography of *Rickettsia burneti*] *Zent. f. Bakt. I. Abt. Orig.* 1954, Apr., v. 161, No. 1, 39-44, 6 figs. on pl. [13 refs.]

The authors describe a method of applying fluorescence microscopy to the study of *Rickettsia burneti*. They have found the procedure of special value in estimations of the number of rickettsiae in yolk-sac cultures and other infected fluids. It is not recommended for investigation of the structural details of the rickettsiae.

Full details are given of the special illuminating outfit required and of the method of preparing specimens for examination. The technique of photomicrography is complicated by the necessity for prolonged exposures but it is claimed that good results can be obtained by the use of objectives having large numerical apertures, by using highly sensitive fine-grain photographic films and by very prolonged development of the exposed films. The clear photomicrographs with which the paper is illustrated strongly support the claims of the authors for the value of the method in suitable lines of study.

John W. D. Megaw

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

RICO-AVELLO Y RICO, C. Fiebre amarilla en España. (Epidemiología histórica.) [Yellow Fever in Spain, Its Epidemiological History] *Rev. Sanidad e Hig. Pública*. Madrid. 1953, Jan.-Feb., v. 27, Nos. 1/2, 29-87, 5 figs. & 1 diagram. [Numerous refs.]

CARLOS FERRARIO, J. Seroprotección amarílica en la población indígena del Territorio de Formosa (Julio 1949). [Serum Tests for Yellow Fever among the Inhabitants of Formosa (S. America)] *Rev. Inst. Malbrán*. Buenos Aires. 1950-53, v. 15, No. 2, 133-9. [11 refs.]

After a brief sketch of yellow fever in various parts of S. America, the author records his results of serum protection tests in mice carried out with 359 samples of blood from residents in the territory of Formosa, between the rivers Pilcomayo and Paraguay. Altogether 420 samples were taken, but only 359 proved suitable. The district was divided into 5 zones: (1) the capital zone, Formosa town and its environs: 42 sera examined, all negative; (2) central zone, along the railway, including the localities of Comandante Fontana, Bartolomé de las Casas, Las Lomitas and Ibarreta: from these 42 were examined [but only in 41 are the results given], all were negative; (3) north-east zone: 160 sera examined, 9 were positive, 5 doubtful and 146 negative; this zone is a triangular area and includes marshy and lake districts which overflow at rainy seasons; (4) north-west zone: 68 were examined, 67 were negative, 1 was doubtful; (5) hilly zone of Laishi-Ituzaingo, with water-courses: 46 sera were examined, none was positive, 43 were negative and 4 were doubtful [= 47]. The author sums these up as follows: 359 samples examined, 9 (2·5 per cent.) positive, 339 negative, 11 doubtful (3·06 per cent.) [but the total doubtful as detailed amounts to 10]. The following table gives the ages of the persons tested:

Age	No. examined	Positive	Doubtful
1-10 yrs.	45	3	0
11-20 ,,	211	0	6
21-30 ,,	56	0	1
31-40 ,,	26	2	2
41-50 ,,	10	1	1
51-60 ,,	5	1	0
61-70 ,,	3	2	1
Unknown	3	0	0
Total	359	9	11

The fact that sera of children under 10 years of age gave positive reactions shows that yellow fever has been present recently.

H. Harold Scott

See also p. 995, SUDIA, **The Effect of Flowing Water on Mortality Rates of Aëdes aegypti (L.) Larvae.**

DENGUE AND ALLIED FEVERS

CLUZEL, P. & ROUX, M. Une nouvelle rickettsiose : la fièvre exanthématische urbaine de Saigon. [A New Rickettsial Disease. Urban Exanthematic Fever of Saigon] *Rev. Méd. Nav. (Métropole et Outre-Mer)*. Paris. 1953, v. 8, No. 2, 151-63, 4 figs.

The authors give a clear description of the clinical features of a benign short fever, affecting almost exclusively the European population, which occurs in epidemic form every year in Saigon, especially among the personnel of the marine arsenal. The description is based on a study of 90 marines seen in hospital between June 1952 and April 1953.

The onset was sudden with a rapid rise of temperature to 39° or 40°C. An almost universal feature was a violent frontal headache localized behind and below the eyeballs. There were muscular and periarticular pains of only moderate severity. The face was suffused, the conjunctivae injected, and a diffuse erythema was seen on the face, arms and upper part of the chest; sometimes there were also macules on the lower part of the chest. On the pharynx there were small but conspicuous red points, especially at the level of the dome of the palate. Sibilant râles and rhonchi or harsh breathing are mentioned, though elsewhere it is stated that pulmonary complications were not observed. General enlargement of the lymph glands was detected in two-thirds of the patients. Soon there was a remission of the fever and other symptoms; this lasted 24 to 36 hours and was followed by a return of the fever but the pulse was remarkably slow in relation to the temperature. A red macular rash now appeared all over the body. This second phase lasted 1 to 3 days, ending by crisis and rapid convalescence. The rash disappeared 2 days after the crisis.

The total duration of the illness, from the first symptom till the day following the fading of the rash, did not exceed 8 to 10 days so that apparently the fever did not last more than about 7 days. In some cases there was only a single spell of fever, and in 6 cases no rash was seen. Albuminuria of brief duration occurred in 14 cases; it ranged from a mere trace to 0.5 gm. per litre, and one patient had generalized oedema with oliguria for a few days. There was no tendency to leucocytosis or to leucopenia, but a constant feature was lymphocytosis; the percentage of the lymphocytes was 25 to 62; in one case it rose to 75. The average lymphocyte figure on the 3rd day was 44 per cent.; it reached the maximum about the fifth day and then gradually returned to normal.

The actual leucocyte counts are not given, but in the absence of any tendency to leucocytosis there must have been a pronounced reduction in the number of the polymorphonuclears *pari passu* with the increase of the lymphocytes.

Weil-Felix tests with *Proteus OX19*, *Pr. OX2* and *Pr. OXK* gave negative responses except that in 8 cases there were "very temporary and often paradoxical reactions". Attempts to isolate an infective organism were made in 9 cases in which guineapigs were inoculated intraperitoneally with the blood of patients, but without success.

In discussing the diagnosis the authors state that the rash and the two-phase temperature curve suggested dengue "and explained the frequent confusion between these two fevers at Saigon. But the epidemiology was not in favour of dengue and above all we have never encountered the slow, painful and distressing convalescence which is almost pathognomonic of that disease" [abstracter's translation].

Other points in the paper are that there was no eschar in any case; that the fever was uniformly benign; that aureomycin failed to influence the

course of the illness in the 8 cases in which it was given. An apparent association between the degree of infestation with rats and the number of the attacks suggested that there was an alimentary infection conveyed by food which had been contaminated by infected rats. No mention is made of the presence or absence of *Aëdes aegypti*. Relapses or second attacks were not seen but there was little opportunity of observing such events because the persons affected were Europeans coming from France or North Africa who did not remain long in Indo-China.

The records of previous epidemics were vague; between 1946 and 1950 there were isolated cases but no epidemics. In 1951 there were 75 cases most of which occurred in the military personnel of the Arsenal in the second half of the year. The present epidemic started in June 1952, and 167 cases were reported up to April 1953 when the epidemic ended. Among the 90 patients seen in hospital there were two peaks in the numbers of monthly admissions: the first was in August 1952 (22 cases) and the second in January 1953 (18 cases). After June 1953 there was a fresh outbreak but no details are given.

The authors state that so far as they know the disease has never been described and they regard it as being restricted to the Saigon region, at any rate to the Mekong delta.

[Most of the medical workers who have had personal experience of dengue and have studied the literature of the disease are likely to regard the authors' description of the clinical and epidemiological features of this epidemic as being entirely consistent with the diagnosis of dengue, especially of the type that occurs among groups of susceptible recent arrivals in infected areas where the permanent inhabitants are largely immune because of previous attacks. In such conditions the virulence of the infection is not high, so that rapid convalescence and the epidemiological features described need not cause surprise. What is surprising, even astonishing, is the announcement that Professor P. GIROUD has reported positive reactions at "satisfactory" titres with sero-diagnostic [presumably rickettsia agglutination] and complement-fixation tests for boutonneuse fever in 28 of the 40 sera tested. A further report is promised on this finding which is regarded as justifying the claim to the discovery of a new rickettsial fever with antigenic relationship to the boutonneuse group of fevers.

If the pathogenic agent of this disease should be shown to be a rickettsia the discovery will be of great importance; it will necessitate a revolutionary readjustment of the present outlook on the short benign fevers of the tropics.]

John W. D. Megaw

ŠIMIĆ, Č. [Epidemic of Sandfly Fever in Serbia in 1946 and in Banat in 1950] *Glas Srpske Akademije Nauka; Odeljenje Medicinskih Nauka*. Belgrade. 1951, v. 204 (n.s.), No. 4, 143-52. [In Serbian.] French summary.

The following is a translation of the author's summary:—

The first large epidemic of sandfly fever was recorded in Serbia in 1946. In the south and east of the country, the number of cases varied from 10 to 90 per cent. [of the population].

The first epidemic in Banat occurred in 1950 and attacked more than half the population of the southern part of the province. The two post-war epidemics of sandfly fever (Serbia, 1946; Banat, 1950) corresponded to two years when *P. papatasi* was abundant: the number of *P. papatasi* captured in Serbia in 1946 and in Banat in 1950 was much greater than in other years. The appearance of *P. papatasi* in such large numbers corresponded

with a considerable rise of temperature. The average temperature from April to October in these two years was, in Banat and Serbia, much higher than the average temperature in Skoplje [Macedonia] during the corresponding period in the years 1925-1935. *H. J. O'D. Burke-Gaffney*

GUELMINO, D. & JEVTIĆ, M. [**The Epidemic of Sandfly Fever in Country Vojvodina in the Year 1951**] *Glas Srpske Akademije Nauka; Odelenje Medicinskih Nauka.* Belgrade. 1953, v. 209 (n.s.), No. 6, 1-11. [In Serbian.] English summary.

In July 1951, an epidemic of sandfly fever occurred in 2 villages in the Srem region of Yugoslavia and ceased in the middle of September. It was caused by introduction of the virus by infected persons and ended with reduction in the number of *Phlebotomus* and cessation of their seasonal activity.

When the *Phlebotomus* were most numerous and active, early and late relapses occurred: no such relapses were recorded in Belgrade, where sporadic cases occurred in the same year. The density of *Phlebotomus* was always much lower in Belgrade than in the Srem villages, largely because of the wide dispersion of the flies in a large city.

The authors conclude as a result of their studies that—

- (1) there are no true relapses in sandfly fever, but further febrile attacks are due to reinfection;
- (2) very small quantities of virus are sufficient to provoke the first attack of the disease, as there are no specific body defences against it;
- (3) for subsequent attacks, massive infection is necessary because of the body defences created during the first infection;
- (4) the development of lasting immunity depends on massive virus inoculation in the first infection or frequent introduction of small quantities of virus during reinfection.

In haematological examination of 68 cases of sandfly fever, the authors found that changes in the white blood picture occurred early and persisted into the first week of convalescence. Leucopenia and relative lymphocytosis were found. Stab cells and basket cells were very numerous. The ratio of small to large lymphocytes was reversed, being 72 per cent. large and 28 per cent. small lymphocytes. Thrombocytopenia was present.

H. J. O'D. Burke-Gaffney

RABIES

NOTE

With reference to the paper by NIKOLITSCH, abstracted in this *Bulletin*, 1953, v. 50, 1133, the last paragraph of the abstract may be amplified by stating that Nikolitsch considers that rabies vaccine (*virus fixe*) occupies the nerve cells, blocking the entry of street virus in infected persons, but that trauma through its physiological or psychological effects, or insulin shock etc., may loosen the vaccine from the cells and thus permit the entry of the virulent virus. On this interpretation the antibody system is held to be unimportant.

BEDNARA, Maria. Die Beeinflussung des Virus fixe durch Hyaluronidase.
 [The Effect of Hyaluronidase on Fixed Rabies Virus] *Ztschr. f. Hyg. u. Infectionskr.* 1954, v. 138, No. 5, 467-74. [23 refs.]

By series of tests carried out on guineapigs and mice with fixed rabies virus, diluted with normal dogs' saliva, injected intra- and subcutaneously, and analogous experiments with hyaluronidase in place of the saliva, the author finds that subcutaneous injection of a brain-emulsion virus with normal saliva gives a combining capacity (*Haftfähigkeit*) in 50 per cent. of guineapigs and 66 per cent. of mice. Details of each of 12 guineapigs and 6 mice are given in tables. Some of the animals died without showing characteristic signs of the disease and these have been excluded; for example, of the 6 mice 4 died of dumb rabies, 2 without characteristic signs or symptoms, and this is recorded as 66 per cent.

With hyaluronidase in place of the saliva all of 9 guineapigs died with typical symptoms of dumb rabies in 1-2 days, recorded as 100 per cent., and 5 of 8 mice died after a day's illness. [The author calls this 65 per cent.; if percentages are allowed in so small a number it should be 62.5.] Intracutaneous inoculation of the hyaluronidase mixture with virus leads to a distinct shortening of the incubation period and to an acute onset of symptoms in the guineapig, whereas in mice the incubation period is unchanged, but the course of disease is very acute. If the virus is inactivated the mixture has no effect on either guineapigs or mice. If *virus fixe* be inoculated into the brain of a guineapig at the same time as the hyaluronidase mixture is administered subcutaneously, the virus infection is blocked in 2 out of 7 animals. Lastly, preliminary subcutaneous injection of the Hempt virus with hyaluronidase blocked in all cases, for an interval of 21 days, *virus fixe* injected intracutaneously. This result was not obtained in rabbits. [For more detail those interested should consult and study the results as tabled in the article.]

H. Harold Scott

PLAQUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

ENGLESBERG, E., CHEN, T. H., LEVY, J. B., FOSTER, L. E. & MEYER, K. F. Virulence in *Pasteurella pestis*. *Science*. 1954, Mar. 26, v. 119, 413-14. [12 refs.]

This is a description of a study of two factors which are regarded as contributing largely to the virulence of *Pasteurella pestis*; these are (1) the envelope substance (Fraction I) which protects the bacillus against phagocytosis and probably also blocks the action of antibodies, and (2) the production of toxin.

The quantity of toxin and of envelope antigen produced in cultures of 6 virulent and 9 avirulent strains of *P. pestis* was estimated by methods described in the paper. A positive correlation was found between the virulence and the quantity of envelope substance produced. The virulent strains produced, on the average, a greater amount of toxin than was produced by the avirulent strains, but 2 of the 9 avirulent strains produced more

toxin than did 3 of the 6 virulent strains. Also one of the avirulent strains produced much the same quantity of both toxin and envelope substance as was produced by one of the virulent strains. It appeared, therefore, that some other factor must be concerned in causing virulence, and it is mentioned that a correlation between virulence and catalase production has been described.

John W. D. Megaw

ENGLESBERG, E. & LEVY, Judith B. **Studies on Immunization against Plague. VI. Growth of *Pasteurella pestis* and the Production of the Envelope and other Soluble Antigens in a Casein Hydrolyzate Mineral Glucose Medium.** *J. Bacteriology.* 1954, Apr., v. 67, No. 4, 438-49, 8 figs. [27 refs.]

The study described in this paper is of a highly technical kind. Its object was to devise improved methods of cultivating *Pasteurella pestis* in such a way as to produce a preparation containing a high proportion of Fraction I, which is regarded as the factor chiefly concerned in endowing plague antigens with immunizing properties. An avirulent strain of *P. pestis* was employed for the most part in the study because it was known to have a high content of soluble antigen and to have remained avirulent for a long time. Its cultivation was carried out at 37°C. in a casein hydrolysate mineral glucose medium the optimum composition of which had to be found by trial. A vaccine was obtained which had a Fraction I content of 1.36 mgm. per ml. as compared with one of 0.28 mgm. in the Cutter-Laboratory vaccine and one of 0.68 mgm. in a sample of Haffkine-Institute vaccine. The maximum concentration of Fraction I was reached on the 3rd day and so also was the maximum number of bacterial cells. After the 3rd day cell lysis occurs and there is an increase in the somatic antigens and the toxins till the 6th day, when lysis of the cells has ceased in the cultures. Reasons are given for regarding Fraction I as being the gelatinous envelope or slime layer of the bacterial cell and as being quite distinct from the true capsule.

John W. D. Megaw

CHEN, T. H. & MEYER, K. F. **Studies on Immunization against Plague. VII. A Hemagglutination Test with the Protein Fraction of *Pasteurella pestis*: a Serologic Comparison of Virulent and Avirulent Strains with Observations on the Structure of the Bacterial Cells and its Relationship to Infection and Immunity.** *J. Immunology.* 1954, Apr., v. 72, No. 4, 282-98. [16 refs.]

The authors describe their methods of applying the Boyden protein-specific haemagglutination test [*Bull. Hyg.*, 1951, v. 26, 562] to the study of the antigens of *Pasteurella pestis*. They began by determining the optimum amount of tannic acid for treatment of the sheep erythrocytes used in the test and of the highly purified protein antigen (Fraction IB) for sensitizing these erythrocytes. They went on to compare the results obtained in the haemagglutination tests of sera of rabbits immunized with the whole antigen of *P. pestis* and of rabbits immunized with the purified Fraction IB. With both types of immune sera strongly positive agglutination reactions occurred, whereas in tests in which sensitized sheep cells were used without preliminary treatment with tannic acid the only positive reactions obtained were in the sera of rabbits immunized with the whole antigen, those immunized with Fraction IB gave negative responses.

Several different antigens and fractions were used as sensitizers for

normal sheep cells and for tannic-acid-treated cells, and tests were made for antibodies (a) in the sera of rabbits immunized against these antigens, and (b) in the sera of animals recovered from plague and of human volunteers immunized with Fraction IB. Full details are given of large numbers of experiments which will be of great interest to those concerned in the preparation of plague vaccines. The general conclusions reached by the authors are that the protein haemagglutination test and the polysaccharide haemagglutination test are highly specific, respectively, for the protein and polysaccharide fractions of *P. pestis*. The protein test is valuable not only for research but also for diagnosis; it was found more sensitive than the complement-fixation and bacterial-agglutination tests and was applicable in the cases of anticomplementary and haemolytic sera. The polysaccharide haemagglutination test was of value in research but not in diagnosis. It was negative or slightly positive with the sera of animals inoculated with virulent living strains of *P. pestis*, though the sera of animals inoculated with killed virulent strains or with living avirulent strains gave strongly positive reactions.

In the course of their experiments the authors found reason for believing that the polysaccharide fraction does not affect phagocytosis and is not a protective antigen for mice or guineapigs, whereas the protein fraction inhibits phagocytosis and is a protective antigen. The amount of protein in the envelope of the cell is regarded as being related directly to virulence and an antigen from a virulent strain or a concentrated Fraction I preparation ought, therefore, to be more immunogenic than an antigen from an avirulent strain.

John W. D. Megaw

NÉEL, R., TASLIMI, H. & EFTEKHARI, M., with the technical collaboration of R. NIKZADEH. Valeur pratique comparée des réactions d'agglutination de conglutination directe, d'hémagglutination polysaccharidique et protéinique pour le diagnostic de la peste. [A Comparison of the Practical Value of the Reactions of Agglutination, Direct Conglutination, Polysaccharide Haemagglutination, and Protein Haemagglutination, in the Diagnosis of Plague] *Rev. d'Immunologie*. 1954, v. 18, Nos. 1/2, 87-106. [57 refs.]

The authors were asked to recommend a highly sensitive reaction for the detection of plague antibodies in highly resistant rodents. Special requirements were ease of execution with small quantities of serum and high degrees of sensitivity and specificity.

The tests studied were: (1) The bacterial agglutination reaction, many modifications of which are discussed. The chosen method is described. It is regarded as being highly specific but its relatively low sensitivity is a drawback. (2) The direct conglutination reaction according to Berlin's method was found to be more sensitive than the agglutination test but it was more time-consuming and more difficult in execution. (3) The original haemagglutination reaction devised by Keogh was found to be of doubtful specificity and was less sensitive than the agglutination test. (4) The protein haemagglutination reaction of Boyden as modified for the diagnosis of plague by NÉEL and BALTHAZARD [see this *Bulletin*, 1954, v. 51, 689] was found to be the most sensitive of all the tests; it was the earliest to become positive and was easy to carry out.

The complement-fixation test was not included in the trials because it was known that the sera of certain wild rodents are anticomplementary and its sensitivity is not greater than that of the agglutination.

Workers interested in tests for the presence of plague antibodies in man and animals will find in this paper a useful summary of the many methods that have been proposed; none of them is likely to be helpful in the early diagnosis of the disease in man.

John W. D. Megaw

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

CHAKRAVARTY, N. Some Factors influencing the Mortality in Cholera.
Calcutta Med. J. 1954, Feb., v. 51, No. 2, 41-7, 5 figs.

This article presents data on the 1908 bacteriologically confirmed cases of cholera admitted to the Nilratan Sarkar Medical College, Calcutta, from July 1950 to May 1952. The same treatment régime was practised throughout and consisted of sulphaguanidine by mouth in addition to the usual intravenous saline medication. There were 565 deaths, giving a case mortality of 29·6 per cent.

A distribution of cases by month of admission shows two distinct epidemic phases during the period. In each of the years 1951 and 1952 there was a sharp increase in the number of admissions during the month of February. In 1951 this increase was sustained until June when 232 cases of cholera were admitted during the month, while in 1952 the peak of admissions was reached in April with a total for the month of 309. Case mortality rates by month of admission varied from 16·1 per cent. in February 1951 to 72·7 per cent. in December 1951.

Of the total patients, 1,230 (64·5 per cent.) were males, but the overall mortality for males (27·3 per cent.) was lower than for females (33·8 per cent.). The highest mortality rates occurred among patients over 60 years (64 per cent.) and the lowest among older children and young adults (18 per cent.).

Typing of the isolated organism was possible in 1,811 cases—subtype Ogawa being involved in 816 and Inaba in 995. The mortality rates for patients infected by these two subtypes of *Vibrio cholerae* were 33·7 per cent. and 26·5 per cent., respectively.

Some social and economic factors which may have influenced the mortality experience are mentioned, and the results are compared with those of previous surveys.

J. T. Boyd

DE, S. N., BHATTACHARYYA, K. & ROYCHANDHURY, P. K. The Haemolytic Activities of *Vibrio cholerae* and Related Vibrios. *J. Path. & Bact.* 1954, Jan., v. 67, No. 1, 117-27. [20 refs.]

The reported occurrence of haemoglobinuria [this *Bulletin*, 1952, v. 49, 1116] and intravascular haemolysis in cholera has prompted the authors to study the haemolytic activity of *V. cholerae*, and allied vibrios, for human, sheep and rabbit erythrocytes. Twenty-seven strains of *V. cholerae* (19 Ogawa and 8 Inaba), 2 strains of El Tor vibrios and 14 nonagglutinable vibrios were examined. In peptone water (*pH* 8·4) all strains of *V. cholerae* haemolysed human red cells and failed to haemolysed sheep cells; 12 haemolysed rabbit cells. The El Tor vibrios haemolysed human, sheep and

rabbit cells. The 14 nonagglutinable vibrios all haemolysed human and rabbit cells, and 12 of them haemolysed sheep cells. In nutrient broth (*pH* 7.2) *V. cholerae* did not haemolyse any of the red cells tested, the El Tor and 11 nonagglutinable vibrios lysed all cells, 3 nonagglutinable strains lysed sheep, but not human cells, and two lysed human but not sheep cells.

The rôle played by calcium in producing haemolysis was studied by growing the vibrios in peptone water rendered calcium-free by the addition of potassium oxalate solution until the filtrate gave no precipitate with calcium chloride or potassium oxalate. In this medium *V. cholerae* produced no haemolysis of human and sheep cells but the haemolytic activity of the El Tor strains was unimpaired. Two of the nonagglutinable strains failed to haemolyse human cells but all haemolysed sheep cells in this medium.

All haemolytic activity of *V. cholerae* was inhibited by the addition of sodium citrate to the 24-hour peptone water cultures, but sodium citrate had no inhibitory effect on haemolysis of any red cells by El Tor vibrios. Its influence on haemolysis by nonagglutinable vibrios varied with different strains.

The following table is taken from the authors' Table I:—

	No. of Strains	Haemolysis in						Nutrient broth	
		Peptone water		Ca.-free peptone water		Citrated or oxalated peptone water			
		Human	Sheep	Human	Sheep	Human	Sheep	Human	Sheep
Red cells									
<i>V. cholerae</i>	27	27+	—	—	—	—	—	—	—
El Tor	2	2+	2+	2+	2+	2+	2+	2+	2+
Non-agglutinable	14	14+	12+	12+	14+	5+	8+	11+	11+
						2±	1±		1±

Saline emulsions of centrifuged deposits of *V. cholerae* did not haemolyse human red cells, but on adding calcium chloride to a concentration of 1, 3 or 5 per cent., haemolysis was marked. Concentrations of 3 and 5 per cent. calcium chloride alone, caused haemolysis but not 1 per cent. Sheep cells were not haemolysed by calcium chloride in these concentrations either with or without *V. cholerae*, but El Tor strains lysed both human and sheep cells in the absence of calcium chloride, as did the nonagglutinable vibrios.

Haemolysis of human and sheep cells by El Tor and nonagglutinable strains was inhibited by 1 to 3 per cent. calcium chloride. Bacteria-free filtrates of *V. cholerae*, El Tor and nonagglutinable vibrios were not haemolytic for human or sheep cells. It was found that *V. cholerae* requires a minimum concentration of calcium chloride of 0.1 per cent. in the medium to lyse human cells, 1 per cent. for rabbit cells, and 16 per cent. for sheep cells.

The saline eluates from 8 peptone agar cultures of *V. cholerae* differed in haemolytic activity; 3 of them were strongly haemolytic but were positive in culture. Of the remaining 5, 2 were not haemolytic and 3 were slightly haemolytic. The eluates from the El Tor culture and nonagglutinable vibrios were haemolytic to a less degree. A clear zone of haemolysis with

a greenish tinge was produced in blood agar plates by *V. cholerae*. El Tor vibrios produced a wider zone of haemolysis than *V. cholerae* but without the greenish tinge.

Stools from clinical cholera were examined for haemolysin. It was found that in cases which gave a pure growth of *V. cholera* haemolysis of human red cells occurred with the unheated but not the heated filtrates. Those which gave no growth of *V. cholerae*, with one exception, showed haemolysis in the heated sample but not in the unheated, and those in which there was a mixed growth tended to give intermediate results. Bacteria-free filtrates of bacteriologically positive stools were all non-haemolytic for human cells.

There is a long discussion on these observations and the authors conclude that calcium is necessary for the lysis of human red cells by *V. cholerae* and that the calcium content of human plasma is high enough to permit such lysis to take place. Since the haemolysin is diffusible it may reach the circulation. The haemolysin is adsorbed by bacterial filters and therefore lack of haemolytic activity in filtrates does not prove that intravascular haemolysis does not take place.

The difference in haemolytic activity between *V. cholerae* and El Tor and nonagglutinable vibrios is explained by the rôle played by calcium which, while essential for *V. cholerae*, inhibits the haemolytic action of El Tor and nonagglutinable vibrios.

This is an interesting and thought-provoking paper and should be read in its entirety as it is very terse and closely reasoned. *C. C. B. Gilmour*

CHAKRAVARTI, H. S., MONDAL, A., MUKHERJEE, A. M. & PAL, N. G. Further Observations on Intravenous Chloramphenicol in Cholera. *J. Indian Med. Ass.* 1954, May, v. 23, No. 8, 381-2.

In general, the authors' results confirm those of CHAUDHURI *et al.* [this *Bulletin*, 1953, v. 50, 810], namely that chloramphenicol produced little benefit in cholera other than a rather earlier appearance of formed stools. There was, however, a much more rapid disappearance of *V. cholerae* from the stools compared with untreated controls and this may be of some public health importance.

The authors, in Calcutta, treated 50 patients with intravenous chloramphenicol and compared the results with those in 50 untreated patients. Most of the patients were between 13-48 years and the disease was usually severe. Over half of the patients had been ill for 6 to 20 hours before admission, and 10 of them had been ill for longer periods. The first 12 patients were given 0.5 gm. chloramphenicol intravenously on admission and then 4 injections of 0.25 gm. at 6-hour intervals: the remaining 38 were given 3 injections of 0.5 gm. "every 4 hours" [presumably at 4-hour intervals] without toxic manifestations. No difference was found between the two forms of treatment. There was little clinical difference in the results between treated and untreated, and patients in both groups required the same quantity of saline. However, stools formed in all but 3 survivors before the 4th day in the chloramphenicol group, but in 37 of 43 survivors among the controls stools did not form until the 4th day or later. Five of the treated and 7 of the control group died. A table shows the striking disappearance of vibrios from the stool in the chloramphenicol group. This occurred in all but 4 by the 3rd day, but in the controls vibrios were still being excreted in 14 by the 4th day, in 8 by the 5th and in 3 by the 7th day.

H. J. O'D. Burke-Gaffney

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

FAUST, Ernest Carroll [A.B., M.A., Ph.D.]. **Amebiasis.** pp. xi + 154, 12 figs. (1 coloured on pl.) 1954. Springfield: Charles C. Thomas, 301-327 East Lawrence Avenue, Illinois. Oxford: Blackwell Scientific Publications, 24-25 Broad Street, [34s.]

This small volume, by a well-known parasitologist, "is intended to provide a concise, comprehensive picture of amoebiasis as a present-day clinical and public health problem". Its contents are divided into 6 chapters which deal respectively with the aetiology, history and geographical distribution of amoebiasis; its natural history; its pathogenesis and pathology; its manifestations and clinical evidences; its diagnosis, treatment and prognosis; and, lastly, its control. Each chapter is followed by a short summary of its contents.

The parasitological aspects of amoebiasis, as one would expect from its author, are dealt with admirably. He adheres to his previously expressed views that an *Entamoeba histolytica* infection is always pathogenic. Cyst size is no indication of the virulence of a strain of the parasite; small-cyst-producing strains can change to large-cyst-producing strains; no strains of the organisms have been proven, experimentally, to be non-pathogenic. There are always tissue changes in the infected large intestine of man, though these may involve only the superficial layers of the mucosa.

The account of the clinical aspects of amoebiasis is less adequate and a little confusing; the protean nature of the symptoms and manifestations of amoebiasis are stressed throughout. Intestinal amoebiasis can be manifest as an acute or chronic dysentery, as "the appendiceal syndrome", as an "asymptomatic infection", or as an asymptomatic infection in so-called "healthy carriers". The recognition of the "appendiceal syndrome" in intestinal amoebiasis is claimed to be "one of the most important and helpful clinical developments in recent years"—but there is no mention of the amoebic typhlitis of earlier workers, and from the description there are no distinguishing features between the two conditions. The manifestations of the "asymptomatic" infection are varied and include general debility, fatigability, digestive disturbances, and marked mental and intellectual impairment, of which "the patients themselves are at times not aware". It is stated that the majority of "so-called healthy carriers" belong to this category; they are asymptomatic, but they are not symptomless and are only called the latter by reason of inadequate clinical study. True asymptomatic infections may occur, but their incidence has not, and probably never will be, determined.

The spread of an amoebic infection from the primary locality in the large bowel to elsewhere in the body is broadly dealt with. Some criticisms may be levelled at this account as a source of practical information to the practising physician—acute local tenderness is neither a constant, nor common, accompaniment of hepatic amoebiasis. Though extremely rare, and indeed most unexpected, complications such as amoebiasis of the spleen, gall-bladder, brain, testes, and the ovaries and tubes receive mention, none is paid to the extension of an amoebic infection from the liver to the peritoneum or the pericardium, with dramatic clinical consequences. Clinical information on the appearance of amoebic granulomata is lacking,

though the condition is by no means uncommon in neglected amoebiasis, and is of major importance to the patient and his doctor.

The account of the diagnosis of amoebiasis by recognition of the parasite is concise and informative; and the author's view that the complement-fixation test is not dependable for general diagnostic use confirms general opinion on this subject. In describing treatment a warning is given that the emetine is "a potentially dangerous myocardial toxicant", and that the amount given must be limited. It is said that electrocardiograms should be made during and subsequent to the administration of the drug—but surely this is beyond possibility in medical practice under any but the most exceptional circumstances; almost all cases of acute amoebic dysentery can in fact promptly be treated with emetine injection under medical guidance as and when they occur, without undue fear of grave side effects. Emetine, in the form of EBI or a similar preparation for oral use, it seems finds no place in the eradication of an intestinal *E. histolytica* infection. The drugs advocated for this particular purpose are (i) the iodo-hydroxyquinoxalines, (ii) arsonic acid derivatives, and (iii) certain antibiotics. Chloroquine is advocated as the present-day drug of choice in the treatment of all forms of extra-intestinal amoebiasis, though it is recognized that the evidence that it is as effective in non-hepatic extra-intestinal amoebiasis as in hepatic amoebiasis is inconclusive. Only in those cases where chloroquine fails should the more toxic emetine be used. The need for subsequent sterilization of the primary bowel infection, very rightly, is emphasized, as in the pleasure at recovery from an acute complication this is too often overlooked.

Finally, the view is expressed that as a public health problem amoebiasis has been neglected; public interest in it is only aroused on the occasion of an epidemic outbreak. Water supplies and food handlers must be beyond suspicion of infection; sewerage must be efficient, and food rigidly excluded from possible faecal contamination. In institutions, or controlled collections of people, in which the incidence of infection is found to be unusually high the simultaneous mass chemotherapy of the inmates with drugs such as Milibis, or Milibis and chloroquine, or Diodoquin, or chiniofon, is both practicable and effective in reducing the incidence of infection. "Amebiasis in the United States today is as serious a public health liability as tuberculosis"—because "its debilitating effects are so difficult to detect and evaluate." Both physicians and health workers must strive to instruct the general public on the personal and communal control of the incidence of amoebiasis without indulging in scare propaganda, the use of which may do irreparable harm.

This monograph gives sound advice and information on amoebiasis as the condition is regarded in the United States; it should be consulted by those for whom it has primarily been written.

A. R. D. Adams

VILLELA-PEDRAS, J. & LOURES, J. de C. A amebíase. [Amoebiasis] Hospital. Rio de Janeiro. 1953, Oct., v. 44, No. 4, 461-96. [46 refs.] English summary.

The authors describe at length a study of intestinal parasites in their private patients, in whom amoebiasis was often suspected. The patients were of good social standing. Between January 1951 and June 1952, they studied 150 such patients having symptoms related to the digestive system, and the methods of examination and results obtained are described, together with a discussion of the literature. Details are given of several cases. The results are given in 11 tables showing the actual and percentage findings and the various associations of parasites. *E. histolytica* was found in 50

(33.3 per cent.) and *E. nana* and *I. bütschlii* in 4 and 3 cases respectively. *Chilomastix* was found in 13 (8.66 per cent.), but other protozoa and all helminths were found in 5 cases or less each. The largest number of infections occurred up to the ages of 30 to 49 years. Eosinophilia was found in 37.1 per cent. of 105 cases.

In 71 cases negative for parasites, *Salmonella* organisms were found in 2, paracolon bacteria in 11 and *Proteus* in 7. These, with the 79 having parasites, gave 99 cases with positive findings. The presence of familial infections is noted.

The public health nature of the problem is stressed and also the need for collaboration between the private practitioners and the health services. The question of individual treatment and the larger question of prevention are discussed.

H. J. O'D. Burke-Gaffney

JONES, Frances E., SMITH, C. S. & EYLES, D. E. Epidemiological Study of *Endamoeba histolytica* and other Intestinal Parasites in the New Hope Community of Tennessee. A Restudy after 21 years. Amer. J. Trop. Med. & Hyg. 1954, Mar., v. 3, No. 2, 266-75, 2 figs.

The incidence of *Entamoeba histolytica* infection, and of other intestinal protozoal and helminthic infections, in a rural district of Tennessee was determined in 1930 [this *Bulletin*, 1932, v. 29, 249]. The present paper records the results obtained on repetition of this investigation 21 years later. In the interval sanitary standards have been advanced and at least half the 79 households now have modern and well-kept privies; wells are the source of water of 40 families and springs that of 36 families; there is no piped water supply. The number of persons involved in the recent study was 322, all whites, and these occupied 79 houses; in 1930 the respective figures were 374 and 75.

The methods of examination of the stools are stated in detail, and the figures of incidence of the intestinal parasites in the various age groups of the population are set out in tables and graphs. These show *E. histolytica* infection to be present in 22.4 per cent. of the population (as against 38 per cent. in 1930); the maximum incidence (35 per cent.) was in the 5- to 9-year-old age group. The figures of incidence in the 1930 and in the recent surveys are set out for comparison in a table. The authors direct attention to the fact that the general level of intestinal parasite prevalence in this white community is considerably higher than that in a Negro population in another similar area, in spite of the lower levels of sanitation and cleanliness prevailing among the latter.

A. R. D. Adams

OKAMOTO, J. A Comparison of Strains of *Entamoeba histolytica* with special reference to their Pathogenicity. I. Comparison of some Biological Characteristics between Indigenous and Foreign Strains. Kitasato Arch. Exper. Med. 1953, Sept., v. 26, No. 1, 83-91, 2 figs.

Before World War II it was estimated that about 5 per cent. of the population of Japan were infected with *Entamoeba histolytica*, but cases of amoebic dysentery were rare, most of them having contracted the infection in China. After the war, when troops returned from the Asiatic and Pacific areas, the incidence rose to 10 per cent., and cases with clinical manifestations became common not only among repatriates but also among the indigenous population.

The author records the results of a comparative study of the morphological

characters of 20 indigenous and 9 foreign strains, based on measurements of 3,900 cysts of the former and 1,800 of the latter. The cysts of indigenous strains measured on the average $12\cdot50 \times 11\cdot89 \mu$, while those of the foreign ones were $13\cdot30 \times 12\cdot48 \mu$. Thus, cysts of the foreign strains were somewhat larger than those of the indigenous ones, but no other morphological differences were found. However, there was no evidence of the existence of races differing in the size of the cysts. [All the measurements quoted refer to the large race of *E. histolytica*, while small cysts of the *hartmanni* type were evidently absent.]

C. A. Hoare

OKAMOTO, J. **A Comparison of Strains of *Entamoeba histolytica* with special reference to the Pathogenicity. II. On the Rate of Infection and Ulcer Formation in Albino Rats which were orally administered with Cysts.** *Kitasato Arch. Exper. Med.* 1953, Sept., v. 26, No. 1, 93-106. [39 refs.]

Having determined the size of cysts in indigenous and foreign strains of *Entamoeba histolytica* in Japan [see above], the author carried out an investigation on the virulence of these—and a new foreign—strains, by experimental infection of laboratory rats which were fed on stools containing the cysts. The infection in rats was determined by daily examination of their droppings, and of the intestinal contents and caecum on autopsy, when the presence and degree of ulceration were also assessed.

The results were as follows. The infection rate with 10 foreign strains was higher (53·1 per cent.) than with 20 indigenous strains (34·5 per cent.). Among the latter 19 were from contact carriers, while one was from a case of acute dysentery and was the only indigenous strain to produce ulceration in the caecum. On the other hand, 4 of the foreign strains, obtained from cases with clinical symptoms, produced ulcers in the rats, while 6—including 5 from contact-carriers and 1 from a case of liver abscess—caused symptomless infections.

It was thus shown that strains which produced severe symptoms in man also gave rise to ulcers in experimentally infected rats, and were therefore more virulent than strains from human carriers. The occurrence of highly virulent strains of *E. histolytica* in Japan is attributed to their introduction from China and the Southern Pacific region by troops returning home after the last war. [It is not explained under what conditions cysts for inoculation of the rats were obtained from 3 persons said to be suffering from "acute amoebic dysentery".]

C. A. Hoare

OKAMOTO, J. **A Comparison of Strains of *Entamoeba histolytica* with special reference to the Pathogenicity. III. Relation between the Size of Cysts and the Pathogenicity.** *Kitasato Arch. Exper. Med.* 1953, Sept., v. 26, No. 1, 107-12. [12 refs.]

In this paper the author sets out to ascertain whether the differences in the virulence between strains of *Entamoeba histolytica* from clinical and symptomless human cases, which were previously demonstrated in experimental infections of rats [see above], were correlated with differences in the size of the cysts from these strains. The material for this study was presented by 5 strains from cases of amoebic dysentery and 24 strains from contact carriers, the behaviour of which in rats was already described [*loc. cit.*]. In each strain measurements, made of 200 cysts in iodine preparations, were treated statistically. The cysts found in the virulent strains

(average diameter $13.77 \times 13.00 \mu$) were on the whole larger than those from avirulent strains (average $12.61 \times 11.88 \mu$). *C. A. Hoare*

KODAMA, T. [New Media for Dysenteric Amoeba] *Iryo (Med. J. Nat. Hosps. & Sanatoriums of Japan)*. 1953, Nov., v. 7, No. 11, 656-60, 5 charts. [In Japanese.]

The English summary appended to the paper is as follows:—

"We investigated successful new media for dysenteric amoeba:

"(1) Our first medium was made by means of adding dry liver powder of cattle into the mucin medium reported by Hayashi and Enomoto et al. Multiplication of amoeba in the medium amounted to 3 or 4 times as many as in the medium developed by Tanabe and Chiba, in the mucin medium or others.

"(2) In the second medium was prepared by adding ascites fluids from liver cirrhosis patients. Culture of amoeba was also satisfactory and even it was possible to culture for more than 15 generations successively. The ascites was diluted by Ringer's solution and if the albumin concentration was near 1%, amoeba multiplication was in the best condition.

"(3) On these new media, few multiplication was observed at 24 hours, and it became most active by the 3rd day of cultivation. Incidentally, at that stage, the value of pH of the media was between 7.2 and 7.6."

LEAL, R. A. Intradermo-reacção na amebíase. Contribuição para o seu estudo. [Intradermal Reaction in Amoebiasis] [Thesis.] 79 pp., 2 figs. [41 refs.] English summary (3 separate mimeographed pp.). 1953. São Paulo.

In this professorial thesis, the author describes an intradermal test for the diagnosis of amoebiasis. Antigen was prepared from cultures of different strains of *Entamoeba histolytica* and *E. moshkovskii*, a known number of which were washed and disintegrated in an electrical shaker, after which extraction was carried out in 1:10,000 dilution of merthiolate in saline at 37°C. For controls, an extract was made from bacteria accompanying the amoebic cultures. The antigen solution was sterilized by filtration through a Seitz filter. The test was made by intradermal injection of 0.1 ml. antigen, and the result was read after 24 hours.

A total of 309 tests were carried out on 141 persons, whose faeces were previously examined directly and by zinc sulphate concentration for the presence of amoebae. These persons were eventually divided into 2 groups: one, comprising 36.3 per cent., with amoebic infection; the other, 63.7 per cent., free of infection.

The data are shown in a number of tables, giving side by side the results of faecal examinations, and the reactions to *E. histolytica* and *E. moshkovskii* antigens, as well as those in the control group. The test revealed a positive correlation between infections detected microscopically and the serological reactions, on the one hand, and between the dysentery amoeba and the free-living one, on the other hand.

The reaction itself appears in the form of an erythema at the site of injection, measuring up to 9-10 cm. In exceptional cases it is manifested about 20 minutes after inoculation, but usually after 3 hours, reaching a maximum after 20-24 hours, and disappearing in 24 to 48 hours. Its appearance is shown in an accompanying photograph. *C. A. Hoare*

SODRÉ, H. de A. & CROCE, J. Granuloma amebiano do intestino grosso. [Amebic Granuloma of the Large Intestine] Hospital. Rio de Janeiro. 1953, Mar., v. 43, No. 3, 305-23. [Numerous refs.]

The English summary appended to the paper is as follows:—

"Seven cases of amebic granuloma of the large bowel are presented. In all cases the diagnosis was confirmed by the therapeutic trial. The authors found only 9 cases in the Brazilian literature; these, added to the 7 cases here presented, sum up to 16 cases. These data point to the rarity of this disease, although intestinal amoebiasis is very prevalent in this country.

"The authors analyse the Brazilian cases, considering specially the distribution according to the sex, age, colour and the localization of the lesion.

"They study the symptomatology and the following subsidiary means: X ray, examination of the feces, rectoscopic examination and biopsy with the microscopic examination.

"In the differential diagnosis they consider cancer and the other inflammatory tumors, mainly tuberculosis, mycosis, syphilis, schistosomiasis, regional enteritis and paracolic inflammatory tumors.

"The authors always use emetine, and in some cases they use penicillin after course of emetine treatment. This therapeutic was highly successful as it cured all the cases here presented.

"The authors have no experience with surgical treatment because all their cases were cured by medical means. They believe that surgical treatment should be resorted to only in those cases where the medical treatment has proved to be ineffective."

GILES, F. L. & HENRY, G. W. Amebic Granuloma of the Cecum, with Report of Two Cases. *Hawaii Med. J.* 1954, May-June, v. 13, No. 5, 358-61, 4 figs. [10 refs.]

"Two cases of amebic granuloma of the cecum are presented. It is important to consider the diagnosis of amebic granuloma in all intestinal conditions, particularly where obstructive symptoms may be present, since it is now possible, with the use of the newer antibiotics, to treat these conditions conservatively without surgery and to obtain an excellent result. The importance of diagnosis and the roentgenologic aspects are presented."

CHAUDHURI, R. N., GHOSH, S. C., GUPTA, S. K., MUKHERJEE, K. L., SEN, G. N. & WERNER, G. Clinical Observations with New Amoebicidal Drugs. Part I: Trials with Resotren. *Indian Med. Gaz.* 1954, Jan., v. 89, No. 1, 9-14, 2 figs. on pl. [25 refs.]

"Resotren", described as a salt of Yatren [chiniofon] with Resochin base [chloroquine], theoretically offers promise as an effective amoebicidal drug in human amoebiasis, because within the intestine the salt is gradually hydrolysed thus liberating Yatren and absorbable Resochin. "The value of the latter in all forms of extra-intestinal amoebiasis is established beyond doubt", but it has been found successful in only about 50 per cent. of cases of intestinal amoebiasis [this *Bulletin*, 1948, v. 45, 430]. Yatren, on the other hand, which slowly liberates free iodine within the gut, is an effective drug in intestinal amoebiasis; the free iodine inactivates mucolytic enzymes produced by clostridia and by other intestinal organisms. The combination of Yatren and Resochin into one molecule, however, results in

a different absorption pattern; half of this almost insoluble compound is hydrolysed in the small bowel and absorbed as Yatren and as Resochin, which act extra-intestinally; the other half reaches the large intestine and only there is it hydrolysed into its soluble components, which therefore can exert their action locally within the large intestine [this *Bulletin*, 1953, v. 50, 813].

Forty-one patients with parasitically proved intestinal amoebiasis, and 14 diagnosed either clinically (9 patients) or retrospectively (5 patients) in view of a good response to treatment, though unconfirmed parasitically, were treated with Resotren.

The scheme of dosage in 20 of them was a tablet [0.5 gm.] 4 times, 3 times, twice, and once daily for 4, 7, 7 and 7 days, respectively. The other 35 patients were treated with 4 tablets and 3 tablets daily for 4 and 7 days respectively. The results, which were similar in both groups, were satisfactory in that "apparent cure" in each case followed treatment; there was clinical amelioration, and parasites vanished from the stools by the end of it. It is not yet established that permanent cure has been obtained in these cases. The only side effect of the treatment was diarrhoea, which in 6 instances necessitated reduction in the dosage.

A. R. D. Adams

HALAWINI, A., ABDALLAH, A., EL KORDY, M. I. & SAIF, M. Treatment of Amoebiasis with Resotren. *J. Egyptian Med. Ass.* 1953, v. 36, No. 12, 747-61, 4 figs. on 2 pls.

In a previous paper the authors have reported on the efficiency of "Resotren" in the treatment of intestinal amoebiasis and on its therapeutic promise in a case of pre-suppurative amoebic hepatitis [this *Bulletin*, 1952, v. 49, 620]. The drug now is stated to be 7-chlor-4-(4'-diethylamino-1'-methyl-butylamino)-quinoline-di-7-iodo-8-oxyquinoline-5-sulphonate, and the structural formula is given. Four patients with amoebic hepatitis, 2 of them with abscess formation, have now been treated with the drug. This paper gives a detailed account of them, with reproductions of X-ray photographs before and after the treatment of the 2 with abscess formation. In each of the 4 cases the manifestations of liver involvement disappeared after Resotren treatment, in one case in association with aspiration.

The authors treated 27 other patients with intestinal amoebiasis with Resotren orally in varying doses. Of 7 patients given 60 tablets in 10 days apparently only one was not cured of his infection; of 12 given 60 tablets in 13 days, all were cured; of 5 given 36 tablets in 21 days, 2 were not cured; and of 3 others given other doses, one was not cured. No side effects other than diarrhoea accompanied the drug treatment; *Giardia intestinalis* infections were also sterilized by the treatment. [It is not clear for how long after the completion of treatment stools were examined in each case. It might be concluded that the term "cure" is applied to cases free from parasites on completion of treatment, and the absence of clinical relapse.]

A. R. D. Adams

BHATTACHARYA, R. C. Chloroquine in Amoebic Hepatitis (with a Report of 14 Cases). *J. Indian Med. Ass.* 1954, Mar., v. 23, No. 6, 259-64.

Details are given of 12 "cases of hepatitis (mostly amoebic) and two cases of giardiasis" which were treated with chloroquine sulphate in Calcutta Police Hospital. From the tabulated data it would seem that the presence of an *Entamoeba histolytica* infection was established in only 2

cases by stool examinations, and that of a *Giarda intestinalis* infection in only one. The dose of chloroquine was 200 mgm. thrice daily for 5 to 8 days and the author considered the results of the treatment to be uniformly gratifying.

A. R. D. Adams

Most, H., VAN ASSENDELFT, F., MILLER, J., MILBERG, M. B. & ROSSMAN, E. B. **Arsthinol (Balarsen). A New Trivalent Arsenical for the Treatment of Intestinal Amebiasis and other Intestinal Protozoa.** *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 262-5.

Arsthinol, also known as "Balarsen" or "STB" (N-2-acetylaminio-4-methyloxy cyclo-(ethylenedimercaptoarseno)-phenol), was introduced by FRIEDHEIM for the oral treatment of yaws [this *Bulletin*, 1949, v. 46, 839]. It has been claimed that in doses of 10 mgm./kgm. daily for 5 days it gives good results in the treatment of amoebiasis without causing toxic side effects.

One hundred and sixty-seven patients in New York, all with proven *Entamoeba histolytica* infections but with few or no resulting symptoms, were given daily oral doses of 4 to 22 mgm./kgm. of arsthinol for 5 days. The dosages and the results of treatment are set out in a table. The results are based on periods of follow-up of 1 month to 3 years in all but 38 patients; about half the patients were observed for at least 6 months after treatment. Some 88 per cent. of the patients were apparently relieved of their *E. histolytica* infections by the course; other concurrent protozoal infections were eliminated by it in a significant proportion of them; associated helminth infections were not affected by the drug. Twenty-one (12 per cent.) of all the patients had significant side reactions as a result of the drug; the chief of these were a rash and fever (in 6 patients); abdominal cramps, vomiting and diarrhoea (in 13 patients); and disorientation, convulsions and stupor or coma (in 2 patients). The toxic potentialities of the drug became evident and serious when a dose of 10 mgm./kgm. daily was reached or exceeded.

A. R. D. Adams

ANDERSON, H. H. **The Use of Fumagillin in Amoebiasis.** Reprinted from *Ann. New York Acad. Sci.* 1952, Dec., v. 55, Art. 6, 1118-24.

Fumagillin, isolated in 1949, was at first thought solely to be an anti-phage; it showed little antibacterial or antifungal action. But in 1951 it was found to be an amoebicide [this *Bulletin*, 1951, v. 48, 640] and its action was proved, *in vitro*, to be a direct one; it was demonstrated to be therapeutically effective against experimental infections with *Entamoeba histolytica* in rats and in rabbits. Its chemical constitution is not known, but it is said to contain only carbon, hydrogen, and oxygen; it occurs in crystals.

Nineteen monkeys (macaques) naturally infected with *E. histolytica* were treated orally with fumagillin in doses of 50 to 125 mgm./kgm. daily for 5 or 10 days; 12 of the nineteen animals were cured of their infections, as judged by a 3-month period of observation following the treatment. There were no gross signs of toxicity, but one animal had continued retention of bromsulphthalein and another an abnormally high blood urea nitrogen level following the drug treatment.

Twenty patients with amoebiasis in Beirut were treated orally with fumagillin, the drug being given cautiously in view of possible deleterious effects: 5 to 10 mgm. were given daily to a total dosage of 50-100 mgm. over a period of 12½ days. The patients were ambulant, so the dosage purposely was kept low; none suffered any untoward manifestations, and there were no

significant changes in their blood urea nitrogen, serum bilirubin, or prothrombin levels. Thirteen of the 15 were cleared of their *E. histolytica* infections. As a control group 10 patients were left untreated; 18 other patients were treated with thiocarbarsone; and 18 others with oxytetracycline; these two amoebicides had been found very effective by the author. Of the 18 treated with thiocarbarsone 16 were cured; of the 18 treated with oxytetracycline 14 were cured. The data relative to all the experiments are set out in a series of tables.

The author concludes that fumagillin is a therapeutically potent amoebicide and that it is a good one for use in cases of chronic, drug-refractive, intestinal amoebiasis. [See also this *Bulletin*, 1954, v. 51, 268, 587, 695.]

A. R. D. Adams

EL-MEHairy, M. M. & GHALIOUNGUI, P. Fumagillin in Amoebiasis. J. Egyptian Med. Ass. 1954, v. 37, No. 1, 1-6.

Sixteen in-patients and 6 out-patients with intestinal amoebiasis were treated with fumagillin. The doses given ranged from 40 mgm. daily to 160 mgm. daily [presumably by mouth] over periods of from 5 to 10 days. In 3 cases the treatment had to be stopped after 3 days on account of the vomiting and diarrhoea it caused. It is stated that the treatment produced a satisfactory clinical response in those in whom it was continued for at least 5 days. It is inferred that those on the highest dosage (160 mgm. daily for 5 days) who were observed for 4 to 6 months were cured of their infections, though parasitic and clinical relapses occurred among those treated with smaller doses (80 mgm. daily) for the same period. Four patients with liver tenderness were relieved of this by the end of treatment, though the liver enlargement did not always vanish. [The scanty details given in this paper are somewhat confusing, and the data on which the conclusions are based seem to the abstracter rather tenuous.]

A. R. D. Adams

PIRES, C. D. de A. & AMARAL, A. D. F. A fumagilina no tratamento da amebíase. [Fumagillin in the Treatment of Amoebiasis] Hospital. Rio de Janeiro. 1954, Jan., v. 45, No. 1, 77-86. [12 refs.]

The English summary appended to the paper is as follows:—

"Thirteen carriers of *E. histolytica* were treated with fumagillin: 10 mgrs., three times a day, during 5 days; afterwards, 20 mgrs., three times a day, during ten days, with the total amount of 75 cgrs. for each patient. Eleven, or 84.6%, of the thirteen patients treated, became free of the pathogenic amoeba. The period of observation of the patients was from 5 to 9 months. Fumagillin acted also against *E. coli* but not against *E. nana*. The drug was well tolerated."

HERMANSEN, I., SCHIAPPACASSE, E., RABAH, A., WELINGER, J. & BIEL, F. Experiencias con fumagilina en el tratamiento de la amebiasis. [Fumagillin in the Treatment of Amoebiasis] Bol. Informaciones Parasitarias Chilenas. 1953, Oct.-Dec., v. 8, No. 4, 72-4.

The English summary appended to the paper is as follows:—

"Fumagillin was used with good results in six patients of intestinal amebiasis. In one case, which was associated with chronic ulcerative colitis, the drug failed. No toxic effects were observed."

CROSNIER, R., DARBON, A., BEISEIGE, H., LAURENS, L. & GALY, J. Note préliminaire sur le traitement de l'amibiase intestinale aiguë par la magnamycine. [Preliminary Note on the Treatment of Acute Intestinal Amoebiasis with Magnamycin (Carbomycin)] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 52-6.

Magnamycin, or carbomycin, is an antibiotic derived from *Streptomyces halstedii*. It diffuses rapidly throughout the body and has a wide range of activity. It is stated that its amoebicidal action *in vitro* is well known, though sometimes disputed. Seven patients from Indo-China or North Africa suffering from acute amoebic dysentery, proven by stool examination, were treated with magnamycin [presumably orally]. The dose was 1.0 to 2.0 gm. daily for 6 to 10 days; most of the patients were given 1.5 gm. doses for 10 days. In each case the diarrhoea ceased and amoebae vanished from the stools after some days of treatment; the patients' condition improved. The rectal ulceration seen initially had healed on the completion of the course of treatment; and the stools were free from parasites by that time. There were no side effects from the drug; it did not seem to affect the coliform organisms within the bowel; *Str. faecalis* was the only bacterial organism affected by it; its action was apparently directly amoebicidal.

A. R. D. Adams

ANDERSON, H. H., NELSON, T. L., HRENOFF, A. K. & FISH, C. H. Antibiotic Synergism in Amebiasis. *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 254-61. [16 refs.]

The authors make some most timely comments on the gross discrepancies in the published reports on the value of various antibiotics [and other drugs] in the treatment of amoebiasis. They conclude that it is "not surprising that we appear to be no more successful today, despite the host of newer agents, including several antibiotics, than we were a decade ago in clearing up more than 90 per cent. of chronic cases with persistent therapeutic measures". *In vitro* studies, studies of natural amoebiasis in macaques, and of artificially induced rodent amoebiasis are of value in a preliminary assessment of the chemotherapeutic value of speculative drugs, but it is in man, under the best controlled conditions possible, that their therapeutic value in clinical practice must finally be determined.

Of the newer antibiotics fumagillin is that which exerts the greatest directly amoebicidal action; it has been reported to be therapeutically effective in the majority of human cases of amoebiasis. The results of laboratory examination, both *in vitro* and on infections in macaques, of fumagillin, of erythromycin, of the two combined, and of neomycin either alone or with fumagillin, are set out in a table. Though neither erythromycin nor neomycin alone was effective to anything like the same extent as fumagillin alone, it was noted that the addition of one or of the other to fumagillin enhanced the amoebicidal action of the latter, both *in vitro* and in macaques. This suggested that such combined therapy might be more effective in man than is treatment with fumagillin alone.

A group of 100 children, between 5 and 14 years old, in a mental hospital was selected for study; 38 of these children were found to have intestinal infections with *Entamoeba histolytica*, and they were individually isolated in the hospital. The 62 remaining uninfected children were treated with accepted amoebicides; further to ensure their sterility care was taken to see that the nursing attendants concerned with them were all free of the infection. Of the 38 infected children 14 were asymptomatic cyst-passers;

9 suffered from recurring attacks of acute amoebic dysentery; 8 actually had diarrhoea and were ill; and 7 suffered from malnutrition and from periodic bowel looseness.

The 38 children were divided into 3 groups and treated orally as follows:—21 with erythromycin stearate (100–400 mgm. daily) plus fumagillin (10–40 mgm. daily) for 14 days; 17 with erythromycin stearate (300 mgm. daily) for 14 days; and 14 with fumagillin (40 mgm. daily) for 14 days. [The apparent discrepancy in the total figure is due to the fact that a child not cured by one course was subsequently treated again with another.] There was a follow-up period of 3 months and search of iron-haematoxylin-stained fixed preparations from at least 10 stools. The parasitic relapse rate was 2 of the 17 patients given erythromycin alone, 6 of the 14 given fumagillin alone, and 5 of the 21 given both antibiotics concurrently. In 8 of the 13 relapse cases intestinal parasites were found in the stools which had not been detected during the pre-treatment examinations. This suggests a possibility of faecal contamination and so of reinfection, in spite of the most careful precautions to forestall this. All but one of these 13 patients who were still infected were subsequently freed of their *E. histolytica* infections by suitable treatment.

The final conclusion from the experiment is that erythromycin treatment was consistently followed by the lowest rate of recurrence, and that this low level was only equalled by fumagillin given with erythromycin at the highest dose levels. The effect of the erythromycin on the associated bacterial flora was doubtless the main factor in eradicating the amoebic infection, and the efficiency of this antibiotic in doing so was most surprising. Bacterial associates in the human intestine may play a more significant rôle in the pathogenicity of *E. histolytica* than has been appreciated. The work is being continued, and even more exhaustive precautions are being taken to avoid the possibility of accidental cross-infections.

A. R. D. Adams

FULTON, J. D., SEARLE, S. & SPOONER, D. F. **Culture Experiments with Amoebae from Laboratory Rats.** *Ann. Trop. Med. & Parasit.* 1953, Dec., v. 47, No. 4, 344–9, 3 figs. on pl. [24 refs.]

In the course of screening tests for amoebicidal compounds, in which rats infected intracaeally were used, it was found that these animals harboured natural infections with *Entamoeba muris*, the presence of which introduced an element of doubt in the interpretation of the results of the chemotherapeutic trials. The authors describe their attempts to cultivate the murine amoeba, regarding the culturability of which the literary data are conflicting. Using a total of 200 laboratory-bred white rats, they inoculated the caecal contents of infected animals into various media, from which subcultures were also made. The latter were discarded, if negative, or continued, if positive. All cultures were kept at 37–38°C.

Cultures of amoebae were obtained from the rats on several occasions, but in the majority they did not survive through more than 5 subcultures. However, 5 cultures were successfully established, and in these the amoebae were fixed, stained, and examined microscopically, when it was found that they actually represented *E. histolytica*. This conclusion was confirmed (1) by the response of this strain to emetine and other amoebicidal drugs, which was similar to that of a known strain of this species, and (2) by the quadrinucleate cysts which the amoebae in question were induced to produce *in vitro*.

This finding of infections of *E. histolytica* in laboratory rats is an additional record of the spontaneous occurrence of this species of parasite in rats, though in the present case the origin of the infection could not be ascertained.

C. A. Hoare

McCONNACHIE, Elspeth W. **The Action of Amoebicidal Drugs on Entamoeba invadens Rodhain, 1934, in vitro.** *Parasitology*. 1954, May, v. 44, Nos. 1/2, 132-43. [26 refs.]

The resemblance of *Entamoeba invadens*, a parasite of reptiles, to *Entamoeba histolytica* in morphology, life cycle and pathogenicity to their respective hosts has led the author to investigate the action of amoebicidal agents on the former parasite *in vitro*. It appeared that since it grows at room temperature and is non-pathogenic to man it might serve as a useful organism for screening of potential amoebicides. The conditions laid down by LAIDLAW *et al.* [this *Bulletin*, 1929, v. 26, 469] in which wholly liquid medium, buffered to give a pH a little above the neutral point and standard time for the drug to act are probably as satisfactory as any. In the literature wide variations in the concentration of emetine required for complete lethality are recorded because of the many different methods of test used.

Further advances in testing were made by the use of cultures of *E. histolytica* accompanied by a single bacterial species [DOBELL (*ibid.*, 1948, v. 45, 518); HANSEN (*ibid.*, 1950, v. 47, 851)] or by *T. cruzi* in the absence of bacteria [*ibid.*, 1950, v. 47, 624, 741]. The method of DOBELL [*loc. cit.*] with improvement in the buffer was used in the present study to determine the activity of emetine and three 4-chloroquinidine derivatives [FULTON *et al.* *ibid.*, 1951, v. 48, 365], on *E. invadens* in presence of a mixed bacterial flora as well as in presence of *Bact. coli* alone. The cultures were incubated at 24°C. in presence of different concentrations of drug and the growth of amoebae was observed microscopically in control and experimental tubes at intervals of 5 and 10 days after inoculation. In the absence of visible live amoebae subcultures were made.

It was found that *E. invadens* was less sensitive to emetine than *E. histolytica*. It is suggested that this may arise partly from differences in metabolic activity between the two organisms. Moreover, emetine is believed to act best on rapidly growing cultures [STEWART, *ibid.*, 1949, v. 46, 831] and the more slowly growing *E. invadens* may be less susceptible to the drug. The sensitivity of the 2 amoebae to the quinaldines was much closer than was the case with emetine. The author does not think, from the results obtained, that *E. invadens* will replace *E. histolytica* for the testing of drugs *in vitro*. A strain of *E. invadens* maintained for 9 months in liquid medium of constant pH in the presence of emetine did not become resistant to the drug.

J. D. Fulton

SIMITCH, T. & PETROVITCH, Z. [Specificity of *Trichomonas* in relation to Host and Localization] *Glas Srpske Akademije Nauka: Odeljenje Medicinskih Nauka*. Belgrade. 1952, v. 205 (n.s.), No. 5, 83-100. [Numerous refs.] [In Serbian.] French summary.

RELAPSING FEVER AND OTHER SPIROCHAETOSIS

BALTAZARD, M. Sur le classement des spirochètes récurrents. [The Classification of Relapsing Fever Spirochaetes] *Ann. Parasit. Humaine et Comparée*. 1954, v. 29, Nos. 1/2, 12-32. [43 refs.]

This is the text of a lecture delivered to the Spirochaete Section of the VI International Congress of Microbiology at Rome in September 1953. The author advocates the use of the term *Borrelia* for all relapsing fever spirochaetes, and proposes the restriction of the term spirochaetosis to infections produced by these organisms. With reference to the so-called specificity of the various strains of relapsing fever spirochaetes, several examples are given of the confusion arising from the common practice of giving a new specific name to any spirochaete isolated from a new host. Thus spirochaetes varying in virulence have been isolated from wild rodents in various countries ranging from the Atlantic coasts of Africa to Persia and described under the names of *S. crociduræ*, *S. microti*, *S. merionesi* and *S. dipodilli*, yet they all produce similar infections in laboratory animals and are transmitted by *Ornithodoros erraticus*.

It is considered that all these are really only minor variants of one species *Borrelia (Spirochaeta) crociduræ*. Similarly strains transmitted by *O. tholozani* have been named respectively *S. persica*, *S. soydiana*, *S. usbekistanica* and *S. babylonensis*, but all are varieties of *S. persica*.

[The author's references are confined almost entirely to French literature. Concerning the specificity of relapsing fever spirochaetes, similar views to the above have often been expressed by previous authors.]

Edward Hindle

HORRENBERGER, R. Spirochaeta hispanica chez les rats d'Alger (nouvelle enquête). [New Observations on Spirochaeta hispanica in Rats in Algiers] *Arch. Inst. Pasteur d'Algérie*. 1954, Mar., v. 32, No. 1, 18-22. [10 refs.]

The following is a translation of the author's summary:—

A recent study resulted in the detection of *Sp. hispanica* in the brains of about 1 per cent. (7 in 662) of sewer rats in the town of Algiers. This proportion is about the same as that recorded in two previous studies made 19 years ago [this *Bulletin*, 1934, v. 31, 87; 1937, v. 34, 703]. Despite the persistence of infection of sewer rats with *Sp. hispanica*, the rarity of cases of Spanish-North-African relapsing fever indicates that this reservoir of the spirochaetes is of only very little danger to man in Algiers.

H. J. O'D. Burke-Gaffney

HEISCH, R. B. Transmission Experiments with Spirochaeta dipodilli Heisch, 1950. *Ann. Trop. Med. & Parasit.* 1954, Mar., v. 48, No. 1, 28-32, 5 figs.

Spirochaeta dipodilli Heisch was first isolated from pigmy gerbils (*Dipodillus* sp.) and *Ornithodoros erraticus* in Kenya. [See this *Bulletin*, 1951, v. 48, 157.]

It was found to be mildly pathogenic to man, but the author now describes 5 cases—2 produced by the bites of infected ticks and 3 by the subcutaneous inoculation of blood containing spirochaetes—in which the clinical symptoms were more pronounced, though less severe than those caused by *S. duttoni*. In addition 2 Africans employed in collecting *O. erraticus* from the burrows of pigmy gerbils, both developed mild attacks of relapsing fever.

Attempts were made to infect *Ornithodoros moubata* with *S. dipodilli*, but although in some cases the infection survived in the ticks as tested by animal inoculation, it could not be transmitted to laboratory animals by the bites of these ticks.

Edward Hindle

BALTAZARD, M. & HABIBI, A. Sur l'infection "inapparente" dans les spirochétoses. ["Inapparent" infections in Spirochaetoses] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 48-52.

The authors discuss the so-called "inapparent infections" which occur with so many species of relapsing fever spirochaetes in vertebrates and which may be briefly defined as the presence in the circulation of an invisible stage of a parasite normally visible.

Convincing evidence is brought forward against the easy explanation that in such cases actual spirochaetal forms are really present but in such small numbers as to escape detection. The white rat, for example, is susceptible to infection with *Spirochaeta latychevi* [see this *Bulletin*, 1952, v. 49, 957], which was isolated from certain wild rodents in which actual spirochaetes could not be found. Yet the blood from these rodents in very small quantities produced similar infections, with similar incubation periods, to those following the inoculation of blood from guineapigs containing numerous spirochaetes.

In another experiment an adult guineapig was bitten by 5 *Ornithodoros erraticus* infected with spirochaetes belonging to the group *S. crocidurae*. The blood of the guineapig was carefully examined daily from the 3rd to the 15th day without any spirochaetes being found. Then 10 drops of blood were drawn off, alternate drops being inoculated into 5 mice and the other 5 drops made into thick films and examined for spirochaetes. The microscopic examination was uniformly negative, but the 5 mice all developed typical spirochaetal infections after incubation periods of 5 to 8 days. The guineapig remained negative until the 30th day when the infection experiments and examinations were repeated with similar results.

Summarizing this and other evidence the authors consider that certain relapsing fever spirochaetes pass through an invisible stage, possibly filterable or granular, and that in these so-called "inapparent" infections spirochaetal forms are absent.

Edward Hindle

SHUSTROV, A. K. [The Reaction of the Ticks *Ornithodoros lahorensis* Neum. and *Argas persicus* F.-W. to certain Factors of the Environment] *Ent. Obozr.* Moscow. 1951, v. 31, Nos. 3/4, 393-7. [In Russian.] [Summary taken from *Rev. Applied Entom. Ser. B.* 1954, Mar., v. 42, Pt. 3, 47.]

An account is given of experiments by a technique already noticed, in which unfed adults of *Ornithodoros lahorensis* Neum. and *Argas persicus* (Oken) were placed in glass tubes, in some of which strips of paper provided crevices, and exposed to different conditions of light and darkness. The following is almost entirely the author's summary. In diffused light, semi-darkness or complete darkness, most of the ticks entered the crevices provided by the paper. When no crevices were available and part of the tube was darkened, they chose the darkened end. When crevices were provided at the illuminated end only, they entered them, and when they were provided at both ends, they entered those at the dark end. In the absence of all crevices, the ticks showed some preference for a light

intensity of 15–40 lux over one of 2–8 lux, but preferred 3–20 lux to 250–360 lux. The results were the same for the two species of ticks and in summer and winter under identical laboratory conditions.

YAWS AND OTHER TREPONEMATOSES

TAVALVES, A. Comunicação sobre um caso raro de parotidite piônica. [Parotitis in Yaws (Case Report)] *Hospital*. Rio de Janeiro. 1953, Feb., v. 43, No. 2, 229–31, 1 fig. French summary.

DE AQUINO, U. M. Intradermorreação na framboesia; crítica de resultados. [Intradermal Tests in Yaws] *Hospital*. Rio de Janeiro. 1953, June, v. 43, No. 6, 765–75, 14 figs.

The English summary appended to the paper is as follows:—

"The author prepared an antigen for Yaws intradermoreaction employing some tissue from early lesions. The studied group had 18 framboesic and 5 syphilitic patients. Only 5 late framboesic patients reacted positively. The others and the syphilitic reacted negatively. All the group reacted negatively to a suspension of normal skin. The author has compared the immunologic results with the histopathologic ones and at last recommends more detailed researches on the subject."

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

INTERNAT. J. LEPROSY. New Orleans. 1953, Oct.–Dec., v. 21, No. 4, Pt. 1, 484–557. **Sixth International Congress of Leprosy sponsored by the Government of Spain with the collaboration of the International Leprosy Association.** With financial aid by the Council of International Organizations of Medical Sciences. Held in Madrid, October 3 to 11, 1953.

This is a special Madrid Congress number of the Journal. Much of the important work of the Congress was done in 5 technical committees and the reports of these committees as accepted by the Congress have already been abstracted in this *Bulletin* [1954, v. 51, 592]. The Congress was the 6th to be held, previous Congresses having been held in Berlin, Bergen, Strasbourg, Cairo and Havana. The registered number of members was 337, but the actual number attending was about 300. The numbers attending the two previous Congresses were, respectively, 167 and 226. Fifty countries were represented, the largest delegations attending from outside Spain being 33 from Brazil, 25 from the U.S.A., 19 each from France and Argentina, and 8 each from Portugal and England. In this number of the Journal, in addition to 8 papers submitted to the Congress and which appear in full or slightly abridged form, 166 papers are listed

under "current literature". Of these 70 are in Spanish, 40 in English, 29 in Portuguese, 21 in French and 6 in Italian. Of these papers, abstracts of 90 appear in the current number.

The Congress was initiated by the International Leprosy Association and arrangements were made by this Association working along with a local Committee appointed by the Government of Spain. In addition to attending the Congress delegates had opportunities for seeing many of the antileprosy activities of a high order which are being carried on under the Sanitary Department of the country.

Ernest Muir

ARQUIVOS MINEIROS DE LEPROLOGIA. 1952, Oct., v. 12, No. 4, 279-426. XI

Curso de Leprologia. [The Minas Gerais Archives of Leprology. XI
Course of Leprology]

This volume is principally composed of an account of a conference of Brazilian leprologists, who had before them for discussion 2 subjects: *Experience with Sulphone Therapy in Brazil* and *The Rights and Aspirations of Brazilian Leprologists* [abstracter's translation].

The first of these took the form of a symposium, answers being made by those present to questions which had been circulated beforehand. There was much discussion on the method of administration of sulphones, whether it should be continuous or intermittent, and the length of time that sulphones remained in the tissues. The criteria of discharge from leprosaria received attention, as did also the frequency of relapse, and the frequency with which the lepromin reaction was converted from negative to positive in lepromatous cases which had become bacteriologically negative. The chairman in summing up spoke of the dispensary as the prophylactic unit *par excellence*, where the disease could be eliminated in its basic forms, although a long time might elapse before we might enjoy the benefit of the new weapon (sulphones). It would be possible for lepromatous patients who after treatment had only a few bacilli left to continue their treatment at dispensaries. The phenomenon, described by SOUSA LIMA, of the negative lepromin reaction being converted to positive in recovered lepromatous cases had not yet been confirmed by many workers. He spoke of lepromatous cases subjected to sulphone treatment, that they "frequently behave like the syndrome of tuberculinic hypersensitivity", and suggested cross desensitizing with tuberculin or BCG. We need more ample and accurate knowledge regarding sulphone-resistance and the time and form of relapses, and more accurate control of symptomatic cures and their possible transformation into biological cures.

The discussion on the rights and aspirations of leprologists revealed a rather disquieting condition. The disease appears to be increasing, but it is difficult to get the personnel necessary to combat it adequately. Dr. DINIZ ascribed this difficulty to the conditions under which work had to be undertaken, and put forward 8 suggestions for improving the circumstances of leprologists, including adequate remuneration, reduced time away from home, better conditions for work, and more facilities for study. Dr. FONTE made a plea for more disinterestedness. Leprosy could not be conquered by sanitation, engineering or immunization. Everything depended on systematic examination of the contacts of the new cases found. In spite of all that might be said to the contrary leprosy was increasing: the returns showed a proportion of 60 per cent. of infectious cases, and 50 per cent. of known cases were not under effective control of the sanitary authorities.

Ernest Muir

MARTÍNEZ DOMÍNGUEZ, Víctor. Estudio epidemiológico y clínico de la endemia de lepra en la Guinea española. [An Epidemiological and Clinical Study of the Endemic Disease of Leprosy in Spanish Guinea] 113 pp., 15 graphs (1 coloured on pl.) & 105 figs. on 32 pls. 1954. Madrid: Instituto de Estudios Africanos, Consejo Superior de Investigaciones Científicas. [60 pesetas.]

This small colony, situated in the Gulf of Guinea, consists of 2 islands, Fernando Po and Annobón, and a district on the African mainland 26,000 square kilometres in area. The population of Fernando Po is 14,735, that of Annobón 1,396, and that of the mainland 129,039. The leprosy rate is higher in the continental area than in the islands, calculated during the last 15 years at about 4,621 cases, and varying in different districts from 71·1 to 2·9 per thousand. The incidence is highest in the interior and especially in the north-east, indicating that infection originally spread with the Bantu invaders from that direction. In the islands the population is much denser and partly urbanized, and the incidence of leprosy is much less.

Under "Incidence in Relation to the Clinical Form" the cause of the greater incidence on the mainland as compared to that in Annobón is discussed. In the former the relation of tuberculoid to lepromatous types is 5·7 to 1; in the latter it is 1·8 to 1, that is, on the mainland the proportion of tuberculoid cases is 3·1 times as great. On the other hand, on the mainland the general incidence is 35 per thousand and only 7·8 per thousand in Annobón. The larger proportion of resistant form cases on the mainland is easily explained by the fact that the disease has been there for a much longer time. But the higher total incidence on the mainland is more difficult to explain on the supposition that leprosy infection goes on producing an increasing resistance to the disease. The author explains the phenomenon by concluding that the lepromin reaction indicates sensitization to *Myco. leprae*, and only indirectly a degree of immunity. Hypersensitivity does not necessarily imply high immunity. Lack of sensitivity (anergy) does not indicate complete lack of immunity in all cases. In Spanish Guinea the population is strongly sensitized by exposure to *Myco. leprae* (100 per cent.); yet the high incidence appears to indicate a low index of immunity. To explain the want of relationship between the high incidence and the comparatively small number of sources of infection (open lepromatous cases) it is necessary to suppose that there is hypersensitivity which increases liability to infection, and at the same time determines a great predominance of hyperergic forms (tuberculoid and indeterminate).

Of the extraneous factors influencing the spread and control of leprosy the most important are considered to be density of population and the arrival of people of a more civilized race. It is found, as it has also been found elsewhere, that though leprosy is less common in the more sanitary conditions of an urbanized area, in spite of the denser population, yet in rural areas where the population is dense the incidence of leprosy is particularly high. The fact that the advent of a higher civilization lowers the incidence of leprosy is explained by the better sanitation which results, and possibly by the spread of tuberculosis which often accompanies the White races, the latter infection bringing about a degree of resistance to leprosy.

Regarding the examination of contacts, generally considered an important part of control methods, the author says that promiscuity is so rife, the people wander about so much, and divorce is so common that it would be necessary to consider every member of the territory as a contact, or at least all those living in the mainland territory. The mortality is not dissimilar from that of the general population, which shows that leprosy is not a killing disease.

The introduction of sulphone treatment had a phenomenal result: instead of avoiding the doctors as before, there was a "veritable avalanche" of patients coming from every corner of the colony, and 1,638 new patients were registered voluntarily within a year. In the campaign against leprosy a new standing order has been issued according to which everyone, of whatever race, has to have a passport with a special visa stating that he is not suffering from leprosy. Anyone suspected of having leprosy can, if it is considered necessary, be kept under observation for a period of up to 5 years. According to the form and condition of the patient he can be kept under observation without or with treatment, but if the disease is open and active he must be isolated.

This brochure is illustrated with numerous photographs and a number of charts and diagrams.

Ernest Muir

LEITE, A. S., DA LUZ, J. V. B. & NOGUEIRA, J. P. Relatório da Missão de Combate à Lepra na Província Ultramarina da Guiné. [Report of a Mission for Combating Leprosy in Portuguese Guinea] *Anais Inst. Med. Trop.* Lisbon. 1953, Mar., v. 10, No. 1, 79-163, 2 diagrams, 18 figs. & 2 coloured folding maps.

This is the report of a party of medical specialists sent from Portugal to investigate the extent and other particulars of leprosy in Portuguese Guinea, and to formulate a policy for its control. The itinerary followed is shown in a map. The method used was that of Dr. Ross INNES in East Africa. The 1950 census gave the total population of the province as 499,770. The number of people examined was 94,389, among whom 2,429 were found suffering from leprosy (2·57 per cent.). It was roughly calculated that 10 per cent. of these were open infectious cases. It is calculated further that in the whole province there are about 12,861 cases of leprosy. It is proposed to treat the closed cases as out-patients at various centres, giving DDS orally, and to admit the open cases to the agricultural leprosy colony at Cumura near Bissau, and possibly later to a second colony in the inland region of Bafata. Cumura will be able to hold between 1,500 and 2,000 patients. The incidence varies among the different tribes, being highest among the Fula (3·5 per cent.) and the Manjaca (4 per cent.). The numbers examined in each tribe, and the numbers of cases found, are shown in a map, and further details are given in several tables. There are 18 photographs showing types of cases and buildings.

Ernest Muir

INNES, J. R. **The Leprotic Child in Africa.** *East African Med. J.* 1954, Apr., v. 31, No. 4, 161-8, 1 graph. [22 refs.]

This study is based upon 1,492 cases of child leprosy found among 7,072 of all ages (21 per cent.) in 7 countries in East and Central Africa. Of these children 867 were males and 625 females. The author considers that the high proportion of children with leprosy indicates that the disease is active and spreading. He considers that "if we ensure that children are removed from all contact with infectious leprosy cases, we can lay the foundation for complete abolition of the disease. We have to think of leprosy as a problem based in the environment and living conditions of *children and the young*". Comparing the types of leprosy among children with those of all ages, the percentages among children were 21 lepromatous, 73 tuberculoid and 6 indeterminate; and in all ages 20 lepromatous, 62 tuberculoid and 18 indeterminate. Children are considered to acquire the disease by living in poor hygienic conditions with adults suffering from leprosy.

Ernest Muir

DEL FAVERO, W. "Follow Up" do Censo Intensivo de Candeias. ["**Follow up**" of the **Intensive Leprosy Census of Candeias**] *Arquivos Mineiros de Leprologia*. 1953, Jan., v. 13, No. 1, 27-41.

An intensive leprosy census of Candeias municipality in Minas Gerais, Brazil, was made in 1944, and this is an account of the results of a re-survey which finished last year. The value of the present survey is lessened by the fact that 26 leprosy patients and 416 of their contacts had left the area during the intervening period. Particulars are given of the 49 patients belonging to the municipality and 86 from outside. The returns for treatment are not satisfactory, as out of 76 patients at present in the municipality 21 took no treatment, 36 attended irregularly, and only 19 attended regularly.

Ernest Muir

MONTEL, M. L. R. Les lésions cutanées de début de la lèpre. La lèpre tuberculoïde, les névrites. [**The Initial Lesions of Leprosy. Tuberculoid Leprosy, Nerve Lesions**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 198-201.

From his experience in Indo-China and in the Hospital of St. Louis in Paris, the author considers that the great majority of cases of leprosy show a tuberculoid histological picture in their early stages. He, however, gives a somewhat wide scope to his definition of "tuberculoid", and sub-classifies it under 5 categories: pure nerve lesions without affection of the skin; plain white or red macules with perivascular infiltration and with or without epithelioid cells; classical major or minor tuberculoids (Wade); border-line (Wade); indeterminate forms. He considers that the nerves are the first tissues to be affected and the last to heal.

Ernest Muir

MONTEL, M. L. R. Un cas de lèpre contractée en France. Contagion familiale. [**A Case of Familial Leprosy Infection Contracted in France**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 201-2.

This note records the case of a woman of 37 in France who developed a tuberculoid leprous lesion in the right popliteal space. Later, a biopsy suggested that this had all the potential cellular elements of "a future leproma" [see above]. No acid-fast bacilli were found in the lesion or in the nasal mucus. The Mitsuda test was strongly positive. The lesion disappeared completely in 7 months after treatment with thiosemicarbazone.

The patient had had close contact with her daughter who had contracted lepromatous leprosy in French Sudan, and this had become generalized a year before her mother's lesion developed. The daughter's nasal mucus was bacteriologically positive.

H. J. O'D. Burke-Gaffney

MONTESTRUC, E. & MARTIN DE MIRANDOL, P. Sur la fixation des bacilles de Hansen au point d'inoculation d'une injection d'anatoxine antitétanique. [**On the Fixation of *Myco. leprae* at the Point of Inoculation after an Injection of Antitetanic Serum**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 196-8.

A patient, who during his military service had been wounded by a rusty nail in the sole of the foot, was given an antitetanic injection in the left

forearm. Round the point of inoculation a smooth light-coloured macule developed with changes in sensibility. This gradually spread, became infiltrated and then formed nodules. When he was examined 3 years later there was a widespread lesion of the forearm with flattening round the point of inoculation. Many lepra bacilli were found in globi in the nodules. The question is discussed whether the bacilli were injected along with anti-tetanic serum or were already in the body and were fixed by the substance injected at the point of inoculation, as sometimes occurs with the tubercle bacillus. The authors, while acknowledging both possibilities, are in favour of the latter explanation.

Ernest Muir

SAGHER, F., LIBAN, E., ZUCKERMAN, A. & KOCSARD, E. **Specific Tissue Alteration in Lepromatous Skin. V. Preliminary Note on Specific Reactions following the Inoculation of Living Microorganisms ("Isopathic Phenomenon")**. *Internat. J. Leprosy*. New Orleans. 1953, Oct.-Dec., v. 21, No. 4, Pt. 1, 459-62, 4 figs. on pl.

This is a further study of "isopathic phenomena" [see this *Bulletin*, 1954, v. 51, 67]. The results are described when BCG and *Leishmania tropica* were injected into the skin of lepromatous patients. BCG was injected in 21 patients, 8 of them with active lesions and all receiving chemotherapy. The lesions produced showed conglomerates of histiocytes or prelepromatous lesions in almost all the cases, whereas controls showed lesions characteristic of tuberculosis. *L. tropica* was injected in 22 patients and produced lepromatous or prelepromatous lesions in almost all instead of the usual lesions produced in normal controls. "The histological development of a granuloma characteristic of the host's altered tissue, in response to injected specific living organisms, has been designated as an 'isopathic phenomenon'." [The authors do not mention the histological picture of the skin, into which they injected the BCG and the *Leishmania tropica*, previous to the injection; they do not seem to have taken control biopsies from the neighbouring skin.]

Ernest Muir

LLOMBART, A. & ALCACER, F. La siderosis hepática del enfermo de lepra. [Siderosis of the Liver in Leprosy] *Rev. "Fontilles"*. Valencia. 1954, Jan., v. 3, No. 5, 363-74, 8 coloured figs. on pl.

The results of autopsies of the liver in 10 cases of leprosy, 8 of them lepromatous, are described. Iron was found deposited to a greater degree than in malignant malnutrition, pellagra and haemochromatosis due to large and repeated blood transfusions. The deposits were in the liver cells, in the Kupffer cells, and in the interstitial substance and connective tissue of the liver. There was also a certain amount of fibrosis and subacute hepatitis.

Ernest Muir

ROSENBERG, J., SOUZA CAMPOS, N. & AUN, J. N. Estado atual do conhecimento da inversão da reação de Mitsuda por efeito do BCG oral. [Present State of our Knowledge regarding the Inversion of Mitsuda's Reaction by means of Oral BCG] *Hospital*. Rio de Janeiro. 1953, July, v. 44, No. 1, 33-73, 11 figs. [45 refs.]

First the technique employed in performing the lepromin test and reading the results is described. A list is given in tabular form of 18 experiments in

which BCG has been administered by various workers and the results obtained in reversing the reaction to lepromin from negative to positive. After oral administration of BCG not only does the negative lepromin reaction become positive in about 100 per cent. of patients, but in course of time the reaction tends to become stronger and it remains positive for at least 3 years. Orally administered BCG also increases the positivity of the lepromin reaction in those originally positive.

To a certain number of children who had not reacted to lepromin BCG was administered 41 days after the lepromin injection, and in some of these a remote reaction was produced, a nodule appearing 30 days after the vaccination at the site of the previous lepromin injection. In many cases, in spite of BCG not producing a positive tuberculin reaction, the lepromin reaction becomes positive. BCG administered in repeated doses to persons positive to tuberculin may gradually desensitize them until their tuberculin reaction becomes negative. Oral BCG administered to lepromatous patients with frequent reactions may make these reactions become less frequent and severe; if this is followed by the injection of tuberculin a reaction of the erythema nodosum type occurs. [This is a very full and clearly argued article which will repay careful study in the original.]

Ernest Muir

SALOMÃO, A. & FERREIRA, D. L. Influência favorável do B.C.G. na evidenciação da reação de Mitsuda em crianças abaixo de 3 anos de idade, na Pupileira "Ernani Agrícola". [**The Favourable Influence of BCG as Evidenced by the Mitsuda Reaction in Children under 3 Years of Age in the "Ernani Agrícola" Preventorium**] *Arquivos Mineiros de Leprologia*. 1953, Jan., v. 13, No. 1, 54-8. English summary.

Twenty-six children removed from a focus of leprosy infection at birth, and between 4 and 36 months of age, were found negative to lepromin. After oral BCG all gave a positive lepromin reaction and 53·8 per cent. a positive tuberculin reaction.

Ernest Muir

AZULAY, R. D. B.C.G. e lepra. [**BCG and Leprosy**] *Hospital*. Rio de Janeiro. 1953, Feb., v. 43, No. 2, 215-28. [24 refs.] English summary.

The author recounts 7 investigations and draws certain conclusions from the results. In Cleveland, U.S.A., where leprosy is not endemic, 74 per cent. of the population were found to give a positive reaction to the lepromin test; this must necessarily be due to a factor other than *Mycobacterium leprae*. In 9 patients hypersensitive to the tuberculin test the early reaction to lepromin was obtained in 9, and the late reaction in only 7. In 7 cases of Boeck's sarcoid, of which 6 were negative to Mantoux, all were negative to the early reaction to lepromin and 6 to the late reaction. In New York, of 42 children of 0 to 5 years of age with pulmonary tuberculosis 19 gave a positive late reaction to the lepromin test, although in leprosy centres the number giving this reaction at this age is not more than 20 per cent. In tuberculous patients with a positive tuberculin reaction 70 per cent. gave an early, and 46 per cent. a late reaction to lepromin. Lepromin-negative children after oral administration of BCG gave 80 per cent. Mantoux-positive, 66 per cent. lepromin-positive in the early reaction, and 80 per cent. positive in the late reaction. Of 20 lepromatous cases who had become clinically and

bacteriologically negative 80 per cent. were positive in the early lepromin reaction and 35 per cent. in the late.

The author concludes from these findings that: (a) a positive lepromin may be induced by *Myco. tuberculosis*; (b) that the early lepromin reaction is more influenced by virulent tubercle bacilli than the late one; (c) that the late lepromin reaction is more influenced by non-virulent tubercle bacilli (such as BCG) than the early one; (d) that the late reaction is an index of protection, and that the early one is allergic.

The author considers that 10 years will elapse before it is possible to say definitely whether or not BCG is of use in the prophylaxis of leprosy; he is therefore experimenting on rats, seeing if he can immunize them to Stéfansky's bacillus by means of BCG, as a quicker indication of this immunizing power.

Ernest Muir

FLOCH, H. La vaccination par le B.C.G. peut modifier la réponse de la réaction de Mitsuda et être essayée en prophylaxie antilepréuse.

[**Vaccination with BCG can Change the Response to the Mitsuda Reaction and be used in the Prophylaxis of Leprosy**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 207-13.

Vaccination with BCG by scarification and by intradermal injection are compared, the former giving positive 57.5 and 69.5 per cent. (early and late readings) lepromin reactions and the latter 93 and 78 per cent. Subjects were found to be more sensitive to killed BCG intradermal reaction than to the cutireaction of Von Pirquet. In 467 infants vaccinated with BCG, the Von Pirquet reaction became positive in 75 per cent., the intradermal reaction to BCG in 87 per cent. and the lepromin reaction (both early and late readings) 73 per cent. It is considered advisable to vaccinate all infants with BCG as soon as possible by the simplest method, scarification being preferred for this reason to intradermal injection although the latter method gives a higher percentage of positive lepromin reactions. If the infants have not been in contact with tuberculous infection they need not be tested before vaccination.

Ernest Muir

BUDIANSKY, Estella & DE CAMPOS, E. C. Possível papel protetor do B.C.G.

contra a lepra. [**Possible Protective Rôle of BCG**] *Arquivos Mineiros de Leprologia*. 1953, Apr., v. 13, No. 2, 107-15. [14 refs.] English summary.

The authors vaccinated orally with 0.20 gm. of BCG 38 children of between 5 and 13 years of age, who were negative to both tuberculin and lepromin. These children were divided into 2 groups: 9 had more or less been in contact with leprosy, the remaining 29 had had no such contact. Of the first group, by the 50th day after vaccination only 2 were positive to Mantoux and 6 were positive on the 90th day. On the 50th day all 9 were positive to Mitsuda, with the exception of 2 all being strongly positive. In the second group 11 were positive to Mantoux on the 30th day, 6 gave doubtful reactions and 12 were negative, while the Mitsuda test, done at the same time as the BCG vaccination, was positive in 21 on the 25th and 30th days, doubtful in 4 and negative in 4. The authors suggest that the action of BCG may be due to a fraction which also exists in lepra bacilli. They urge the necessity of studying persons vaccinated with BCG and who are in contact with a leprosy focus.

Ernest Muir

VILANOVA, X. & CATASÚS, J. M. La prueba de Nelson-Mayer (inmovilización treponemica) aplicada al suero de los enfermos de lepra. (Nota previa.) [The Nelson-Mayer Test (Treponema Immobilization) applied to the Serum of Leprosy Patients. (Preliminary Note)] *Internat. J. Leprosy.* New Orleans. 1953, Oct.-Dec., v. 21, No. 4, Pt. 1, 453-7. English summary.

On account of the frequency of false positive results with other tests for syphilis in leprosy patients, the treponema immobilization test (TPI) was applied by Nelson. With the former tests he found that out of 75 lepromous patients 57 (76 per cent.) were positive, but with TPI only 11 (19 per cent.), corresponding with the percentage of 15 to 20 of undetected syphilis in the general population. But in this experiment no mention of the classification of the cases was made.

The present authors contend that false positives are far more common in the lepromatous than in the other forms of leprosy, and that if the TPI is really specific and excludes false positives in leprosy, it should exclude them equally in tuberculoid and lepromatous cases. For this reason they tested 18 leprosy patients of whom 8 were lepromatous, 9 tuberculoid and 1 indeterminate. The ordinary serum tests gave only 2 positives, and this is accounted for by the fact that all had improved under treatment. In one the TPI was definitely positive and in the other doubtful; one of these had a definite history of syphilis and the other was a probable infection. The results are considered to confirm the findings of Nelson that TPI is specific for syphilis in leprosy, but the authors intend to seek further results before coming to a definite conclusion.

Ernest Muir

FERRAND, B. La ponction biopsie du foie dans la lèpre. [Puncture Biopsy of the Liver in Leprosy] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 2, 203-7, 1 fig. on pl.

Five lepromatous cases are described in which a liver puncture was done and the material recovered examined microscopically. The author was surprised to find lepromous nodules in the hepatic parenchyma. Masses of bacilli were found in the usual nodular formation, with Virchow's cells and a more or less dense infiltration of histiocytes. The nodules were often numerous and sometimes in the region of the intralobular vein, occasionally the size of 20 liver cells. The Kupffer cells were often parasitized, but bacilli were not observed in the liver cells, which were pushed aside by the nodules. There was also a diffuse infiltration of lymphocytes and monocytes, but this inflammatory appearance was inconstant and moderate in degree. The author considers this method of examination safe if precautions are taken, and preferable to puncture of the sternum or testicle. It might with profit accompany skin biopsy or gland puncture.

Ernest Muir

MARIANO, J. Considerações sobre os aspectos clínicos e localização da nevrite leprosa. [Considerations of the Clinical Aspects and the Locality of Lepromous Neuritis] *Arquivos Mineiros de Leprologia.* 1953, Apr., v. 13, No. 2, 136-9. English summary (9 lines).

Lepromous neuritis is unique in being the only neuritis caused by an ascending bacillary infection. In 300 cases examined the ulnar nerve was the most affected, being found in 223. The external popliteal was next in frequency occurring in 96. Only in lepromous neuritis are the volume and consistency both of the nerve trunks and the slender nerve filaments modified by the infection.

Ernest Muir

DHARMENDRA, CHATTERJEE, K. R. & BOSE, R. **Preliminary Tests with a New Sulphone Drug.** *Leprosy in India.* 1954, Apr., v. 26, No. 2, 65-6.
[Reprinted from Bull. Calcutta School Trop. Med. 1954, Apr.]

This new sulphone (4:4'-diamino-2:2'-dihydroxy-diphenyl-sulphone), prepared by an Indian firm, was found to be of low toxicity when tested in guineapigs. It completely inhibited the growth of Kedrowsky's acid-fast bacillus when added in a 1 in 100,000 dilution, and a 1 in 1,000 dilution mixed with an equal quantity of suspension containing 14,000 million bacilli per cc. for 3 hours at 37°C. prevented growth up to a week. It is proposed to test it clinically so as to compare the results with those of DDS (dapsone).

Ernest Muir

DHARMENDRA & CHATTERJEE, K. R. **Isonicotinic Acid Hydrazide in the Treatment of Leprosy.** *Leprosy in India.* 1954, Apr., v. 26, No. 2, 49-54. [13 refs.]

First the somewhat conflicting results obtained with the hydrazine derivatives of isonicotinic acid (isoniazid) are reviewed. In the authors' own trials 31 patients were chosen so as to include "various kinds of lesions and complications, such as reactions and ulcers, etc.". There were 24 of the lepromatous type. Before starting the trials thorough examinations of all patients were made. The dosage began with daily doses of 50 mgm. (25 mgm. in the reacting cases) rising to 400 mgm. in 12 cases and to 200 mgm. in the others. The average length of treatment was 42 weeks in the non-lepromatous, and 35 weeks in the lepromatous. None of the patients with reaction derived any benefit. Of the 17 lepromatous patients who tolerated the drug all showed initial clinical and bacteriological improvement within 2 to 3 months. "The bacteriological improvement was in general more marked than usually seen with sulphones and thiosemicarbazones in a similar period".

The drug is on the whole well tolerated in daily doses up to 400 mgm. It is of definite value in the first 8 to 12 weeks, especially in reducing the bacteriological concentration, but on the whole it is not very effective in the treatment of leprosy since there is usually a setback in the initial improvement. In the non-lepromatous cases there was only temporary improvement. It is suggested that it be used in combination with sulphones on the assumption that strains of leprosy bacillus resistant to isoniazid are formed, or a change over to sulphones or thiosemicarbazones may be made after 2 months' treatment with isoniazid.

Ernest Muir

CONTRERAS, F., GUILLEN, J., PONZIANI, J. & TERENCIO, J. Hemoterapia en las leprorreacciones. [**Haemotherapy in Lepra Reactions**] *Internat. J. Leprosy.* New Orleans. 1953, Oct.-Dec., v. 21, No. 4, Pt. 1, 441-52, 8 graphs. English summary.

This paper is in continuation of one abstracted in this *Bulletin*, 1953, v. 50, 424. In that paper heterologous calf plasma was employed with good results in most cases, though in some there were unfavourable allergic reactions. The use of homologous plasma was equally useful and there were not so many unfavourable results. In localized reactions of lesser degree, especially in the eyes, daily injection of 10 to 20 cc. of the patient's own blood for 7 days gave excellent results. More recently a blood bank has been set up in the city of Valencia, so that now there is sufficient whole

blood to treat all cases of reaction. Remarkable results from this form of treatment are recorded. In the more intense form of reaction there was complete clearing up of symptoms in 51·4 per cent. of patients within 3 days or less. In less acute cases the percentage was 41·2, with less striking improvement in another 23·5 per cent. In more chronic cases there was cure or improvement within 3 to 5 days in only 10 per cent., and transitory improvement in the others. In ocular reactions the pain and photophobia cleared up within 2 or 3 days in 20 per cent., and there was some improvement in another 37·5 per cent.

Several typical cases are described. The theory on which this form of treatment is based is that during lepra reaction there is a hyper-proteinaemia, and it is reasonable to remedy this by adding whole blood.

Ernest Muir

WOLCOTT, R. R. & ROSS, Hilary. **Exacerbation of Leprosy during Present Day Treatment.** *Internat. J. Leprosy.* New Orleans. 1953. Oct.-Dec., v. 21, No. 4, Pt. 1, 437-40, 6 figs. on pl.

Case histories and clinical photographs are given of 3 patients with lepromatous leprosy who showed much improvement at first under sulphone and other drugs, but later suffered exacerbations and wide extension of new lesions over the body. "The possibility of clinical and bacteriologic exacerbation must be considered in evaluating the prognosis of patients undergoing present day treatment." [The authors say nothing about whether or not these patients took sufficient physical exercise, the lack of which has been found by some workers to provoke similar exacerbations.]

Ernest Muir

CONTRERAS, F. Profilaxis de la lepra. [**The Prophylaxis of Leprosy**] *Rev. Sanidad e Hig. Pública.* Madrid. 1953, Mar.-Apr., v. 27, Nos. 3/4, 226-47.

This is a very thorough history of means that have been taken to control leprosy from the earliest times. Four stages of evolution are described: (1) the period of terror of leprosy; (2) the period when all leprosy patients were compulsorily segregated; it is difficult to understand the attitude of DANIELSEN and BOECK, who insisted on this segregation, yet declared that leprosy was spread by heredity; (3) prophylaxis by isolating infectious cases and treatment of all, which was recommended at the second international congress held at Bergen in 1909; (4) early diagnosis by examination of contacts of known cases, and the treatment of all cases found. This last method as now followed in Spain is fully described. Ernest Muir

TRAVERSA, E. L'état actuel de lutte contre la lèpre en Italie. [**Present State of Leprosy Control in Italy**] *Internat. J. Leprosy.* New Orleans. 1953, Oct.-Dec., v. 21, No. 4, Pt. 1, 463-5.

The English summary appended to the paper is as follows:—

"There were 391 known leprosy cases in Italy at the end of 1952, of which 190 were hospitalized as contagious. The disease exists in coastal regions where there is much maritime traffic and movements of migration. Special attention is given returning emigrants, for early diagnosis. No secondary case has been found in the families of cases discovered early,

but there are some in families of such people who had not been diagnosed until late.

"For isolation, there are four special pavilions connected with dermatological clinics in Bari, Genes, Messina and Cagliari, three of them being enlarged and improved. There is also being built at Pouilles an agricultural colony, on an area of 43 hectares located quite distant from centers of habitation, with a section composed of cottages in which members of the same family may live together. Here there may be effected voluntary isolation of patients who are bacteriologically negative and classified as noncontagious.

"It is planned to provide financial aid for both the patients and their families during the period of hospitalization. This measure is expected to aid in the discovery of cases which now avoid detection because of the fear of economic dislocation."

BUSHBY, S. R. M. & BARNETT, Margaret. **Isoniazid Resistance in Murine Leprosy.** *Internat. J. Leprosy.* New Orleans. 1953, Oct.-Dec., v. 21, No. 4, Pt. 1, 467-8.

The authors and several other workers [this *Bulletin*, 1953, v. 50, 522, 523, 524 bis] have previously reported the suppressive effect of isoniazid in murine leprosy, although no such spectacular effect has been found in the human disease. They pose the question whether this failure is due to lack of sensitivity of *Myco. leprae* to isoniazid or whether this organism becomes rapidly resistant as *Myco. tuberculosis* does. This is of practical importance as, in the latter case, resistance might be prevented by a combination of drugs.

They have continued their previous experiments with *Myco. leprae murium* in mice and find that the beneficial effect of isoniazid is only temporary. The animals died in a year and the spleen, liver and skin were found to contain myriads of organisms, comparable in numbers to those seen in untreated mice.

They attribute this to development of resistance, since isoniazid failed to protect other mice infected with spleen suspensions from the originally treated animals. Also a similar passage made with the few organisms present in the original animals, killed after 180 days of treatment, showed that they also were resistant.

The authors point out that different species of mycobacteria vary in their sensitivity to isoniazid. For example, strains of *Myco. tuberculosis*, avian type, required 50 μ gm. per ml. for their inhibition—a concentration not usually attained with the present therapeutic doses. It might well be argued that *Myco. leprae* is also somewhat insensitive, but the authors consider that their experiments with *Myco. leprae murium* strongly suggest that isoniazid fails in man because resistant strains develop rapidly (in mice they developed within 6 months).

They therefore plead that, as in the case of tuberculosis, isoniazid should be used in leprosy only in conjunction with other known effective drugs, and add that they are studying in mice experiments designed to decide the best combination of drugs.

H. J. O'D. Burke-Gaffney

HELMINTHIASIS

*In this section abstracts are arranged as far as possible in the following order:—TREMATODES (schistosomes, other flukes); CESTODES (*Diphyllobothrium*, *Taenia*, *Echinococcus*, other cestodes); NEMATODES (Hookworms, *Ascaris*, Filarial worms, *Dracunculus*, etc., *Trichuris*, *Enterobius*, *Trichinella*, etc.).*

DENECKE, K. Die Helminthosen im Irak. [Helminthic Infections in Iraq] *Arch. f. Hyg. u. Bakter.* 1954, v. 138, No. 2, 149–56.

Helminthic infections are common in Iraq because sanitation and disposal of refuse are of a low order. In the villages latrines are few, in the side streets of the towns faecal dumps are found and the fields are manured with fresh faeces. In the town hospital of Hillah, on the bank of the Euphrates, of 800 examinations of faeces between September and November 1953, 128 (16 per cent.) contained *E. histolytica*, 106 (13·2) ova of *Ascaris lumbricoides*, 59 (7·4) *Strongyloides stercoralis*, 240 (30) *A. duodenale*, 1 *Taenia saginata*, 6 *Hymenolepis nana*; and of 750 urines examined 110 (14·6) contained ova of *S. haematobium*; but, in Hillah schoolchildren only 4·9 per cent. were passing the last-named. The numbers of patients treated between 1944 and 1949 in 14 provinces showed a high percentage of urinary schistosomiasis cases, e.g. 67 per cent. of 7,179 in Amara, 48 per cent. of 13,387 in Kut, 35 per cent. of 34,716 in Baghdad. Treatment has to be prolonged because patients are loth to attend, hospital beds are lacking, and attendances at the clinics are irregular. The number treated at the State centres in 1944 was 15,852; in 1949 27,388, and it is estimated that those infected are 3–4 times as many and that of the 5 million inhabitants there are between 200,000 and 250,000 suffering from chronic schistosomiasis. The vector is *Bulinus contortus*.

Ankylostomiasis (*A. duodenale*) is also rife; between the same years, 1944–49, the number of patients treated annually ranged from 6,332 to 13,912 and *Strongyloides stercoralis*, as stated above, 7·4 per cent., *Ascaris* ova in 13·2 per cent. of the Hillah examinations, *Trichuris trichiura* ova in 1·4 per cent. only. *Dracunculus medinensis* infection varies; it is rare in the Mesopotamian steppes, but common in other parts. The commonest platyhelminth is *Hymenolepis nana*, but *T. saginata* is rare and *T. solium* infection practically unknown (the population is Moslem). *Echinococcus* occurs in sheep and dogs. Infection of man due to dogs licking their hands and face is rare because in Islamic lands the dog is looked upon as “unclean”.

Chronic secondary anaemia cases, due to hookworm and schistosomiasis, are fairly common and are made more so by the diet which is deficient in albumin and vitamin B. In the Hillah hospital patients only 13 per cent. had haemoglobin over 81 per cent., and only 6 per cent. over 91 per cent.; 22 per cent. had between 61 and 80, 30 per cent. between 41 and 60, and 25 per cent. between 21 and 40 per cent. Erythrocytes were under 2 million per cmm. in 13; 2–3 million in 16; 3–4 million in 29; 4–5 million in 14, and over 5 million in 5 only. Eosinophiles were counted in a few only, 137; in 79 none was seen, 38 had the normal 1–4, 20 had 5 or more; 5 had 7; the highest was one with 38 eosinophiles.

H. Harold Scott

RICCI, M. & MENNA, F. Sull’azione dell’esilresorcinolo verso alcuni elminti intestinali. [On the Treatment of Helminthiasis with Hexylresorcinol] *Rendiconti Istituto Superiore di Sanità*. Rome. 1954, v. 17, Pt. 4, 326–32. [13 refs.]

The English summary appended to the paper is as follows:—

" Children between 19 months and 12 years of age, the most part affected by more than one helminthic disease, were treated with hexylresorcinol (Crystoids) *per os*. 93 children had one dose of the drug, while 28 received two doses at an interval of 4 days. The results were the following. Negative results in 2 cases of *H. nana*; most striking results against *A. lumbricoides* (with one dose, 76.47% of cases recovered completely; with two doses, 90.91%); good results against *E. vermicularis* (with one dose, 50.82% of cases recovered; with two doses, 77.78%). As far as *T. trichiura*, it was observed that, following the administration of the drug, the number of eggs in the stools decreased markedly; one dose of drug showed almost no therapeutical effect, two doses showed a mild effect. The administration of the drug showed no side effects."

DE SCHIENS, R. Sur un test d'activité antihelminthique des médicaments.

[**A Test of the Anthelmintic Activity of Drugs**] *Bull. Acad. Nat. Méd.*
1954, v. 138, Nos. 11, 12 & 13, 184-5.

To avoid the cost and difficulties of using dogs, cats, bovines and other animals for anthelmintic tests, the author has devised a method that uses *in vitro* tests on helminths in faecal cultures and *in vivo* tests on species found in mice. He found that 20-80 per cent. of mice harbour the tape-worm *Hymenolepis nana* var. *fraterna* and that 20-40 per cent. harbour the nematode *Aspiculuris tetraptera* and he also uses mice and hamsters experimentally infected with *Schistosoma mansoni*. The substances tested are dissolved in water or normal saline or, if they are insoluble, they are given in the form of a fine suspension in a julep or an emulsion for licking. The chemotherapeutic index (relation between the curative dose and the toxic dose) and the host's tolerance are studied. The following test is proposed:

(1) A pilot experiment on the *in vitro* action of a solution or suspension of the substance tested on a faecal culture of the non-parasitic species *Rhabditis macrocerca*, saprozoic in the faeces of the wild rabbit, this species being, according to the author, resistant to anthelmintics in general.

(2) Study of the *in vitro* action of the substance on the non-parasitic larvae of the sheep stomach-worm, *Haemonchus contortus*.

(3) Study of the *in vivo* action of the substance on 6 mice per test infected with the tapeworm *Hymenolepis nana* var. *fraterna* or the nematode *Aspiculuris tetraptera*. For this test the author injects *per anum* 0.75 cc. per mouse of 20 gm. weight every day for a number of days varying according to the substance injected, the concentration of the substance in the fluid injected also varying with the substance injected (e.g. 0.001 gm. per 0.75 cc. for crystal violet per 20 gm. mouse). A 20 gm. mouse should not receive *per anum* more than 0.75 cc. or the fluid will overrun the pylorus and the mouse will die in a few minutes. If at post-mortem no helminths are present in the intestine of the mouse, or if they are present, but dead, the result is positive; if any helminths are present alive the result is negative.

(4) Controls are done *in vivo* under the same conditions on helminths found in rabbits and especially on the oxyurid *Passalurus ambiguus*.

The test usually indicates the anthelmintic properties of the substances tested and will exclude substances giving negative results. The anthelmintic activity is often elective and then the preferential action of the substance must be tested by clinical, medical or veterinary tests, with the usual modes of administration and considering the fact that the dose will vary with the species to which the host belongs.

Among the numerous substances tested the following have given positive results: derivatives of triphenylmethane for enterobiasis, phenothiazine for enterobiasis, basic desoxybenzoins for urinary schistosomiasis, piperazine and its derivatives for filariasis, ascariasis and enterobiasis, tin oxide for taeniasis and intestinal schistosomiasis.

G. Lapage

DESCHIENS, R., POIRIER, M. & LAMY, L. Sur l'action antihelminthique des dérivés de l'éthylène-diamine et de la pipérazine. [The Anthelmintic Action of Derivatives of Ethylene-Diamine and Piperazine] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 83-6.

The authors refer to several French workers who claim to have used piperazine successfully for the treatment of human enterobiasis and ascariasis. The authors themselves here record the results of their treatment of 13 cases of enterobiasis with piperazine hydrate. The children among these patients were given 0.1 to 0.2 gm. and the adults 0.4 gm. of piperazine hydrate on 8 consecutive days, this treatment being repeated after a week's rest. In 9 children aged 5-12 years clinical symptoms disappeared and no female worms or eggs were found. Similar results were noted in the 4 adults. The examination a month later confirmed the disappearance of the worms. The authors conclude that piperazine hydrate is a practical, nontoxic anthelmintic to be recommended especially for children. [No details of the examinations of the patients are given.]

DESCHIENS (*Bull. Soc. Path. Exot.*, 1949, v. 42, 322) has previously pointed out that the derivatives of ethylene-diamine and of piperazine have polyvalent anthelmintic properties in relation to numerous nematodes parasitic in the digestive canals and lymphatic system and especially to the oxyurids of mice and man, to *Ascaris lumbricoides*, *Wuchereria bancrofti* and *Loa loa*. In this paper the authors briefly discuss the chemical composition of ethylene-diamine and of its derivatives and note that the first observation known to them on the value of piperazine for the treatment of enterobiasis was made by one of their colleagues, P. GIROUD, who noted that a patient given piperazine in the course of general treatment was cured of the enterobiasis he had in addition to another unspecified illness. This observation was the origin of the authors' present work and they refer to their earlier *in vitro* tests of the anthelmintic action of the substances discussed in the present paper on non-parasitic nematodes belonging to the genus *Rhabditis* and to their *in vivo* tests of their action on the oxyurids of rodents, *Syphacia obvelata* and *Aspiculuris tetraptera* and on *Hymenolepis nana* var. *fraterna* and also on unspecified nematodes in rabbits.

G. Lapage

SCHWETZ, J. Sur la bilharziase vesicale à Kongolo. [Urinary Schistosomiasis at Kongolo, Belgian Congo] *Inst. Roy. Colonial Belge Bull. des Séances*. 1953, v. 24, No. 4, 1411-44, 1 map.

This schistosome enquiry at Kongolo, Belgian Congo, was carried out during the period 24 April to 21 May, 1952, and consisted of urine and stool examinations for schistosome eggs, searches for snail vectors and their examination for cercarial infection, treatment with Miracil of some selected cases and a historical account of the disease based on annual medical reports.

Physopsis was found in large numbers in certain places but planorbid snails were very scarce. Only 5 *Physopsis*, of many hundreds examined, were found infected. White mice were successfully exposed to infection with the cercariae. Five groups of people, totalling 811, were examined

for infection with *S. haematobium* and of these 66·7 per cent. were positive. The highest infection rate, 90 per cent., occurred in the Misalwe village group, and the lowest, 36·2 per cent., in the Mission Schools group. Examination of stools revealed a few cases of infection with *S. mansoni* and also a few with *S. haematobium*.

The author comments on the annual medical reports on schistosomiasis at Kongolo, from which it appeared there was a steady decrease of *S. haematobium* infection from 1932 to 1939 when it disappeared only to reappear again in 1944.

Experimental treatment with Miracil of 5 adults and 13 children infected with *S. haematobium* gave very favourable results. J. J. C. Buckley

RANSON, G. Observations sur les Planorbidae Africains. [Observations on the African Planorbidae] Bull. Soc. Path. Exot. 1953, v. 46, No. 5, 783-810, 6 figs. [14 refs.]

After general observations on the difficulty of defining species, and on the necessity for strict adherence to the law of priority in specific and generic nomenclature, the author discusses the need to place the classification of the Planorbidae on a basis of anatomical rather than shell characters. Earlier accounts of African planorbids (e.g. PILSBRY and BEQUAERT, Bull. Amer. Mus. Nat. Hist., 1927, v. 53, 69) are almost entirely conchological. The author takes as a starting point the recent fundamental revision of the anatomy of the Planorbidae by BAKER (1945, *The Molluscan family Planorbidae*, Univ. of Illinois Press, Urbana) from whom, however, he differs on several points concerning important African species. Ranson accepts Baker's separation of the Bulinidae from the Planorbidae, and his subdivision of the latter into the Planorbinae, Segmentinae, Helisomatinae and Planorbulinae, for which subfamilies Baker's diagnoses are quoted. The author greatly modifies Baker's division of the subfamily Planorbinae into 12 genera. The changes result from anatomical work published elsewhere (RANSON and CHERBONNIER, Bull. Mus. Nat. Hist. nat., Paris, 1952a and 1952b, 2nd Series, v. 24, 206 and 306) which shows that the following African species: "Planorbus" adowensis, *P. pfeifferi*, *P. rüppellii*, *P. sudanicus*, *P. smithi* and *P. choanomphalus*, all have prostatic diverticula with subdivided extremities connected directly to the vas deferens without any special prostatic canal. Baker had erected the genus *Afroplanorbis* (used as a subgenus by Thiele in 1931), taking *A. sudanicus* (Martens) as the type species, and including *A. adowensis* (Bourguignat) and *A. pfeifferi* (Krauss); and had used the genus *Biomphalaria* Preston 1910, for the single species *B. smithi* Preston. Since all the above-mentioned species conform in their genital anatomy with that of *B. smithi*, Ranson concludes that *Afroplanorbis* must be regarded as merely a synonym of *Biomphalaria*, which has precedence. Further, earlier published descriptions of the anatomy of certain species from South America and the Antilles, placed by Baker in the genus *Australorbis*, also correspond to the anatomical characteristics now described for *B. smithi*, and these species must likewise be included in *Biomphalaria*. The present paper reproduces clear figures of the genitalia of *Biomphalaria pfeifferi*, *B. choanomphalus*, *B. smithi*, *B. stanleyi*, *B. sudanicus* and *B. rüppellii*, and in the text the following African species are also noted as belonging to that genus: *B. adowensis*, *B. gaudi* n.sp., and *B. madagascariensis*.

The author reduces the number of genera in the Planorbinae to 4 and his conclusions regarding them can be summarized in a key:—

- (1) Species with prostatic diverticula having subdivided extremities, and lacking special prostatic canal:—*Biomphalaria*
- (2) Species with simple prostatic diverticula, but with special prostatic canal:
 - (A) Species with penis bearing stylet:—*Anisus*, *Gyraulus*
 - (B) Species with penis without stylet:—*Planorbis* (in which the author includes *Tropicorbis* and *Armiger*).

The classification of the Bulinidae is briefly discussed, noting that Adanson's type bulinid conforms to the diagnosis for *Pyrgophysa*, which genus therefore must be regarded as a synonym of *Bulinus*, the latter having precedence. In summary, the family Bulinidae consists of 3 genera:—(1) *Bulinus* O. F. Müller (= *Pyrgophysa* Crosse); (2) *Isidora* Ehrenbergh (= *Bulinus* of many earlier authors); (3) *Physopsis* Krauss.

The author then lists the species of Planorbinae recorded in Africa, indicating those species which, on anatomical grounds, can be placed in the genera *Biomphalaria* or *Gyraulus* as defined above. Many species cannot be so designated, as their anatomy is at present unknown. Separate lists are given for South Africa, Equatorial Africa, Central Africa (subdivided into West, Central and East), North Africa, Egypt and Madagascar. Finally the known African species of the genera *Segmentina*, *Hippeutis* and *Planorbula* are listed.

[Recently, attention has been directed to the importance of malacology in relation to tropical medicine (this *Bulletin*, 1954, v. 51, 329; *Nature*, 1954, Mar. 27, v. 173, 556). A better systematic knowledge of the African Planorbidae is promised by Ranson's careful studies on the anatomy of genital apparatus in the group. Though his general views on the mechanism of speciation cannot appeal to many biologists, Ranson has already clarified the very complex systematics of the Ostreidae, and it is to be hoped that he will continue his revision, both of relationships and of nomenclature in the Planorbidae. However, it should be stressed that, as Ranson himself notes, up to the present the anatomy of the majority of African planorbids remains unknown. Further, the eventual completion of a sound taxonomy of the group will not itself solve the problems presented by these snails as hosts of trematodes. Attention must also be given to ecological variation within each snail species. Recent work (HUNTER, *Proc. Roy. Soc. Edinb.*, B., 1953, v. 65, 143) has emphasized the extent to which physiological variation between different populations can occur in a single Basommatophoran species.]

W. Russell Hunter

NOR EL DIN, G. & EL BAZ, I. Sputum Examination in the Diagnosis of Bilharziasis of the Lungs. *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 326-8.

Since 1950 sputa from patients with evidence of pulmonary schistosomiasis have been examined for schistosome ova by the authors in Cairo. To the 24-hour specimen of sputum 5 per cent. caustic soda is added; after 2 hours the sediment is examined. This examination, when done on 62 patients for 3 to 6 successive days, yielded ova in 22 of them; *Schistosoma haematobium* ova were found in 20, and *S. mansoni* ova in 2. Four of the patients had haemoptyses; these 4 all excreted numerous ova in their sputa. Although the sputa of 4 other patients, all with a history of schistosomiasis, contained ova none could be found in their faeces or urine at the time. Most of the patients on examination had physical signs of pulmonary or cardiac changes, but in 12 of them these were no more than pulmonary rhonchi or crepitations; 5 patients suffered from asthmatic attacks; in 14 the liver and spleen

were enlarged; 4 had ascites. Whenever there is an episode of haemoptysis in a patient with schistosomiasis the sputum should be examined for ova.

A. R. D. Adams.

NOR EL DIN, G. & BAZ, I. I. **Sputum Examination in the Diagnosis of Bilharziasis of Lungs.** *J. Egyptian Med. Ass.* 1954, v. 37, No. 1, 75-81.

See above, p. 949.

SIRRY, A. **Radiological Study of Chronic Appendicitis with special reference to Bilharziasis of the Appendix.** *J. Egyptian Med. Ass.* 1954, v. 37, Nos. 2/3, 221-46, 7 figs. on 8 pls. [15 refs.]

The author describes an exhaustive study of 120 cases of chronic appendicitis in which the diagnosis was confirmed by radiological study. In Egypt, because of the frequency of schistosome infestation of the intestinal tract, a large number of those who suffer from this disease show signs and symptoms of chronic appendicitis. The ova, when deposited in hollow viscera such as the colon or bladder, will cause considerable local inflammatory reaction, giving rise to pseudotubercles composed of giant cells, eosinophiles and "round cells", which are later replaced by whorls of fibrous tissue in which degenerated and calcified ova are found. We expect to see similar changes in the musculature of the appendicular wall after being invaded by schistosomes. The appendix then loses its function and power of contraction and becomes a source of continuous symptoms, which can be cured by appendicectomy, provided that other systems are not simultaneously affected. The author found 30 cases of schistosomiasis of the appendix in his series of 120 cases of chronic appendicitis.

With an ordinary barium meal the appendix fills in 40-50 per cent. of cases, but with the Cambies' technique, in which the meal is followed 3 hours later by 20 gm. of magnesium sulphate, 100 per cent. of appendices can be visualized. The characteristic radiological signs of chronic appendicitis are:

Direct Signs: (1) failure to fill, or incomplete filling due to stenosis of the lumen; (2) appendicular concretions or irregularity of the lumen; (3) fixation or tenderness of the appendix; (4) appendicular stasis. If a filled appendix is tender to the touch and the tenderness moves with it, the appendix is diseased. If the appendix is not visible, but there is tenderness over the ileo-caecal angle and the tenderness moves with the caecum, the appendix is diseased. If the appendix is visible, tender, fixed completely or in part, or mobile, and there is evidence of stasis for 48 hours or more, the appendix is diseased.

Indirect Signs: (1) ileo-caecal spasm is seen in 80 per cent. of cases; (2) partial fixation of the caecum is found in both erect and horizontal positions—the normal range is 6-7 cm.; (3) ileal stasis due to reflex spasm occurs, sometimes lasting 10 hours after the meal; (4) nervous reflexes are present between the appendix and the pyloro-duodenal region, causing stomach residue for more than 6 hours; (5) there is reduction in range of expansion of the right cupola of diaphragm. The barium meal gives most information about the physiology of the organ, the enema gives the morphology and demonstrates organic defects.

A detailed analysis of the clinical findings in the 74 females and 46 males (63 of the patients were Italian women) is tabulated, from which it appears that in only 17 cases had the symptoms been present for less than 5 years and in 45 they were of 16-20 years' duration; nearly all patients complained

of colic with tenderness at McBurney's point as the chief symptom. Urinary symptoms were present in 4 cases and schistosome ova were found in the urine in 4 cases and in the stools in all 30 cases of schistosomiasis. All the patients were examined radioskopically and details of the findings are given. The appendix was visualized in 96 cases, not visualized in 24; appendicular stasis was observed up to 120 hours in 80 cases, up to 96 hours in 10, 72 hours in 2 and up to 48 hours in 4 cases. Ileal stasis was observed in 14 and gastric residues in 8 cases. Urinary tract changes were detected in 4 cases of schistosomiasis. Operation was performed in 116 cases, in 90 of which the surgeon's report coincided with the radiological findings. All the removed appendices were examined histologically and examples of the findings are given. In the 30 cases of schistosomiasis it was found that histological examination showed destruction of the muscular wall, which was replaced by whorls of fibrous tissue containing ova. There was retention of barium in all the cases of schistosomiasis quoted.

A series of reproductions of serial radiographs and of photomicrographs in 7 cases illustrate the points discussed.

[Full details of the radiological findings in the 30 cases of schistosomiasis would have been of interest.]

W. L. Harnett

MACLEAN, G. & HAY, Ursula. **An Experiment in the Control of Schistosomiasis: First Report.** *Ann. Trop. Med. & Parasit.* 1954, Mar., v. 48, No. 1, 21-7.

This paper records an attempt to control *Schistosoma haematobium* in a community of 3,600 people on an island in Lake Nyasa. The measures employed were mass treatment and an attack on the main concentrations of vector snails. The genera of snails present included *Bulinus*, *Physopsis*, *Lanistes*, *Melanoides* and, in one area, *Planorbis*. Snails were tested for discharge of cercariae and only the first two genera were found to discharge fork-tailed cercariae. Funds were inadequate to treat the whole area infested with snail vectors so treatment was confined to pools, rice fields and a narrow strip along the most frequented parts of the lake edge. Copper sulphate was used in stagnant pools in a minimum concentration of 10 parts per million and in the lake in concentrations varying with the depth. Each area was examined the day after treatment and was re-treated if live snails were found. Re-infestation of treated areas in the lake occurred in 2 to 3 months, and new and large concentrations of snails appeared when the water level rose after the rains. Poisoning of snail habitats was repeated monthly for another 5 months.

After a mass survey of the population 6 weeks after the initial snail campaign, all infected persons were treated with a total course of 30 mgm. Nilodin [lucanthone] per lb. body weight, commonly given in doses twice daily for 3 days. About half the treated persons were re-examined on a single occasion and the remainder 2 or 3 times. Of 349 who were negative at the first examination after treatment 28 were subsequently found positive. At a second mass survey of the population some 5 months after the conclusion of the treatment campaign 145 infected persons were detected, including 45 of the 801 who had been treated.

T. H. Davey

PEREIRA, R. B. O fígado na esquistossomose de Manson. (Follow-up de provas de função hepática em 230 pacientes.) [**The Liver in Schistosomiasis mansoni**] Hospital. Rio de Janeiro. 1953, July, v. 44, No. 1, 115-25. [21 refs.] English summary.

PESIGAN, T. P., GARCIA, E. G., BANZON, T. C., BELTRAN, A. M., SANTOS, A. T., AÑOVER, M. & BASACA-SEVILLA, V. **Further Studies on Intradermal Test in Schistosomiasis japonica.** *J. Philippine Méd. Ass.* 1954, Jan., v. 30, No. 1, 14-22.

The authors have extended their preliminary studies [this *Bulletin*, 1951, v. 48, 1015] using the same antigen. The result was read by comparing the measured diameters of the reaction provoked by a control intradermal injection (of 0·3 per cent. phenol in normal saline) and that provoked by the antigen (0·03 cc. of a 1/3,000 dilution of an extract of adult flukes in phenolized saline). The weals usually reached their maximum size in 20 to 30 minutes, and faded after an hour; the measurement was taken at 30 minutes; a clear positive was read when that produced by the antigen exceeded that of the control injection by at least 3 mm.; a negative was read when the control weal was at least equal to that produced by the antigen.

Some 4,220 patients, of both sexes and ranging in age from 3 to 72 years, were subjected to the test. Some (1,812) were from *Schistosoma japonicum* endemic areas, the remainder were from non-endemic areas. Of 1,051 of these, having eggs in the stool, 84·11 per cent. gave positive, 9·80 per cent. doubtfully positive, and 6·08 per cent. negative tests. Of the remaining 761 patients from endemic areas but from whom no eggs were recovered 31·14 per cent. gave positive, 8·67 per cent. doubtfully positive, and 60·15 per cent. negative results. Of 2,258 patients from non-endemic areas and who were apparently well, 2·39 per cent. gave positive, 1·24 per cent. gave doubtfully positive, and 96·36 per cent. gave negative tests. Of 150 other patients from these same non-endemic areas who were suffering from various illnesses, and from whom no ova were recovered, 2·66 per cent. gave positive and 97·33 per cent. negative tests.

The authors consider that a positive or doubtfully positive test is of specific significance in the detection of *S. japonicum* infections in mass surveys. The false positive tests disclosed in non-infected, clinically healthy persons, and in persons suffering from various illnesses, do not exceed 3 per cent. By means of periodic repetition of the test on various age groups in mass surveys of a locality it may be possible to assess the amount and extent of transmission from time to time. *A. R. D. Adams*

MANSOUR, T. E., BUEDING, E. & STAVITSKY, A. B. **The Effect of a Specific Antiserum on the Activities of Lactic Dehydrogenase of Mammalian Muscle and of Schistosoma mansoni.** *Brit. J. Pharmacol. & Chemotherapy.* 1954, June, v. 9, No. 2, 182-6, 1 fig. [15 refs.]

"1. Sera from roosters which had been immunized against lactic dehydrogenase from rabbit muscle markedly inhibited the activity of this enzyme but did not affect those of the lactic dehydrogenases of *Schistosoma mansoni* and of *Schistosoma japonicum*.

"2. It is concluded that lactic dehydrogenase of schistosomes is not identical with that of mammalian tissues although these enzymes catalyse the same reaction in the parasite and in the host."

KOMIYA, Y. & KAWANA-TAJIMI, T. **The Development of the Excretory System of Clonorchis sinensis in its Definitive Host.** *Japanese J. Med. Sci. & Biol.* 1953, Dec., v. 6, 571-5, 2 figs.

"The flame cell formula of *Clonorchis sinensis* in its definitive host remained as the same as that of its cercaria and metacercaria stage up to

about ten days after infection. Later the expansion of the flame cell formula is carried on rapidly. In the course of development, each original flame cell in the metacercaria stage divides itself at six to fourteen in number conveniently. No regularity is found in the division of flame cells in *Clonorchis sinensis* in its definitive host. Such an aspect of the expansion of flame cells in its definitive host is quite similar to that in *Fasciola hepatica* and *Echinocasmus*."

URQUHART, G. M., MULLIGAN, W. & JENNINGS, F. W. **Artificial Immunity to *Fasciola hepatica* in Rabbits. I. Some Studies with Protein Antigens of *F. hepatica*.** *J. Infect. Dis.* 1954, Mar.-Apr., v. 94, No. 2, 126-33, 2 figs. [27 refs.]

"1. Serums from rabbits infected with *Fasciola hepatica* were found to contain precipitins which reacted with a protein fraction prepared from the adult parasite.

"2. Immunization of rabbits with proteins of *F. hepatica* was shown to stimulate the production of these precipitins in relatively large amounts, as measured by quantitative precipitin tests.

"3. Immunization of rabbits with these proteins prior to infection was shown to produce inhibition of development of the parasites, but did not reduce their numbers significantly."

DESCHIENS, R., CECCALDI, J., LAMY, L. & RAVISSE, M. **Sur un nouveau cas africain de sparganose humaine. [A new African Case of Sparganosis]** *Bull. Soc. Path. Exot.* 1953, v. 46, No. 6, 958-61, 4 figs. on 2 pls.

Ocular sparganosis is relatively common in Korea, China and the Far East, sporadic in tropical and South America and Australia, but very rare in Africa and Europe. The authors record the infection of an African from Mimbellé, in the Dougou district, French Equatorial Africa, which is the fifth case known in Africa, and describe the larva found, giving 2 photographs of it and 2 photomicrographs of sections of it. They give references to papers on the 4 other African cases. [For an additional case, see this *Bulletin*, 1954, v. 51, 613].

In 1953, while operating on the patient described for inguinal hernia, the authors found a ribbon-shaped worm, which looked like a small *Taenia*, actively freeing itself from the muscle planes of the conjoint tendon. It was 18 cm. long by 3 mm. broad and 700 microns thick, and it was extending and contracting itself. The anterior end was spatulate, measuring 5 mm. long and 4 mm. broad and had an axial, groove-like depression; the posterior end measured 3 x 3 mm. and was bifid, with two short digitations. Sections showed a finely porous cuticle, a subcuticular layer of large cells, transverse and longitudinal muscles and a parenchyma composed of large oblong or polygonal cells traversed by muscles and containing ovoid calcareous corpuscles.

The specific identity of the larva could not be established without study of the adult worm, but the authors identify it as the larva of a species of the genus *Diphyllobothrium*. Some authors recognize 3 species of this genus whose larvae may cause human sparganosis, namely, *D. mansoni*, *D. erinacei* and *D. decipiens*; others refer all these species to the species *D. erinacei*. [WARDLE and MCLEOD (*The Zoology of the Tapeworms*, this *Bulletin*, 1952, v. 49, 1011) refer the species just mentioned to the genus *Spirometra* and define a "sparganum" as the "larval stage

of any species of *Spirometra* ". They discuss the relationships of the genera *Spirometra*, *Diphyllobothrium* (*Dibothriocephalus*) and *Ligula* to which "spargana" have been referred.]

G. Lapage

NISSEN MEYER, R. *Taenia Saginata*. [Taenia saginata] *Tidsskr. f. d. Norske Laegeforening*. 1954, June 15, v. 74, No. 12, 424-5.

The Bodø Hospital in the North of Norway, serving a population of about 100,000, had not dealt with a single case of *Taenia saginata* during the decade preceding 1949. Since then 11 cases have been dealt with. Several were given treatment with flix mas, and two with gentian violet, all with a relapse within 2 or 3 months. These failures led to a trial of atebrin [mepacrine], the dosage of which was to begin with only 0.8 gm. This dose led to the evacuation of many segments, but not of the head of the *Taenia*, and a relapse occurred. But there were no relapses when the same dose was given twice or three times in the course of a week. There was also no relapse after a single dose of 1.2 gm. A 4-year-old girl receiving 3 doses (0.3, 0.3, and 0.25 gm.) in the course of a week also showed no relapse. This treatment invariably yielded a long chain of segments coloured yellow and looking as if they were tanned. In some cases the atebrin was supplemented by the conventional ritual with castor oil, strong black coffee and a bulky saline enema, but Nissen Meyer thinks that by giving as much as 2 gm. of atebrin in the course of 2 days, it should be possible to dispense with all such measures. No serious complication from this treatment need be expected, and the yellow discolouration of the skin and sclerae passes off.

Claude Lillingston

ANTTONEN, V. M. **Flavaspidic Acid as an Anthelmintic.** *Ann. Med. Exper. et Biol. Fenniae*. Helsinki. 1954, v. 32, No. 1, 15-25. [22 refs.]

No really satisfactory drug against tapeworm has been discovered. Male fern is the drug mostly used, but the toxicity and effectiveness of the various samples differ considerably. It is claimed that all effective samples of male fern extract contain flavaspidic acid; the estimates of the flavaspidic acid content of crude magnesium filicin varies from 6 to 28 per cent.

The author undertook a clinical trial with flavaspidic acid. The criteria for cure adopted by different workers vary considerably. The author has considered treatment successful if the worm or part of the worm was passed and the follow-up examination of the stools showed no ova. Treatment was given to 76 patients aged 14 to 79; over half were in the 50 to 69 age group; and the great majority had some complicating disease.

A light meal was taken in the afternoon before and the drug was given in water or coffee on an empty stomach in the morning; after 2 hours a dose of 25 gm. of magnesium sulphate was given and 2 hours later an enema. The dosage of flavaspidic acid was 0.5 to 1.5 gm.; the maximum was given in one case only. Of the 76 cases, in 65 treatment proved successful; 7 were cases of *Taenia saginata* infection and all of these were successful, and the rest *Diphyllobothrium latum* infections.

These results were more satisfactory than those obtained by the author when he used extractum filicis, though they are not as good as those reported by some other workers who used the last-named drug.

Side-effects were produced in 10 cases; these were not severe and, in view of the serious condition many of the patients were in, the author considers this very satisfactory.

He considers that in doses from 0.5 to 0.8 gm. flavaspidic acid is an effective and harmless anthelmintic, but that in subjects with hepatopathy, coronary insufficiency, and those who have shown intolerance to male-fern extracts, special care should be taken.

L. E. Napier

GOLDBERG, E. & NOLF, L. O. Succinic Dehydrogenase Activity in the Cestode *Hymenolepis nana*. *Exper. Parasit.* New York. 1954, May, v. 3, No. 3, 275-84, 2 figs. [27 refs.]

" 1. TTC [2,3,5-triphenyltetrazolium chloride] was used under aerobic and anaerobic conditions to demonstrate succinic dehydrogenase activity in the cestode, *Hymenolepis nana*. It was observed that there was not equal reduction of the dye in all proglottids comprising the strobila of an intact worm. Reduction was observed in proglottids which were punctured with a surgical needle.

" Methylene blue was also used to verify the presence of this dehydrogenase.

" Preliminary studies conducted qualitatively indicated that sodium malonate inhibited succinate oxidation and TTC reduction.

" 2. Apparent individuality of proglottids of the same strobila was observed and discussed. It was suggested that there are permeability differences along the strobila and that there may be an active and selective absorption of carbohydrates by proglottids, possibly involving phosphorylation processes."

RAUSCH, R. Studies on the Helminth Fauna of Alaska. XX. The Histogenesis of the Alveolar Larva of *Echinococcus* Species. *J. Infect. Dis.* 1954, Mar.-Apr., v. 94, No. 2, 178-86, 8 figs. [11 refs.]

" The larva of the St. Lawrence Island cestode attains its alveolar form by means of a rapid rate of proliferation of exogenous secondary vesicles. This also explains its ability to invade host tissue so rapidly, and with such a malignant effect. It is concluded, then, that ability in the St. Lawrence Island cestode to produce secondary vesicles exogenously constitutes the main difference between its larval development and that of *Echinococcus granulosus*."

CANABAL, E. J., DIGHIERO, J., SUZACQ, C. V., AGUIRRE, C. V., PURCALLAS, J. & BALDOMIR, J. M. Historia de la equinococosis cardíaca en el Uruguay. [History of Cardiac Echinococcosis in Uruguay] *An. Facul. de Med. Montevideo.* 1953, Nov.-Dec., v. 38, Nos. 11/12, 465-79. [51 refs.]

The English summary appended to the paper is as follows:—

" The authors carry out a thorough review of all Uruguayan bibliographic data relative to echinococcus disease of the heart and make special comments on the important contributions made by our medical school to the subject.

" They emphasize that this disease, of mere academic interest up to a few years ago, must be considered as a curable and reversible heart disease if diagnosed at the early stages of its evolution."

See also p. 1005, MILLER, Dung Beetles (Coleoptera, Scarabaeidae) and other Insects in relation to Human Feces in a Hookworm Area of Southern Georgia.

HARTZ, P. H. **Strongyloidiasis with Internal Autoinfection in Children.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1954, Mar., v. 6, No. 1, 61-8, 6 figs. [17 refs.]

The case histories are presented of two children, aged 11 years and 18 months, respectively, including post-mortem findings with histological studies of the colon and liver. They were seen in San Cristóbal, Venezuela.

The first case was that of a girl, who had been admitted to hospital twice previously in a similar condition, with generalized nutritional oedema and probably tuberculosis of the larynx; the oedema disappeared under suitable treatment. On this occasion, she complained in addition of diffuse pains in the abdomen. There was no X-ray evidence of lung involvement, but ulceration of the vocal cords. There was a 1 per cent. eosinophilia but on previous admissions it had been as high as 12 per cent. Among other parasites, *Strongyloides stercoralis* larvae were found in the stools. After a temporary improvement, the girl died on the 16th day of admission.

At autopsy, caseous foci were found in the lung and hilar glands and tuberculous ulceration in the larynx and intestine: there was thrombosis of the femoral veins and embolism of several branches of the pulmonary artery.

Sections of the transverse colon showed filariform larvae in all the layers down to the subserosa, but a greater number in the mucosa and submucosa. The epithelial layer of the former was, however, intact. The local reaction varied from none to a sharp inflammatory reaction with a moderate number of eosinophiles or a granulomatous reaction with a few eosinophiles.

In the liver, larvae were found mainly in the portal tract but a single larva was seen within a lobule. The eosinophile reaction again was moderate. The pancreas showed advanced atrophy.

The second child was admitted with generalized oedema and pellagroid skin lesions. Larvae of *S. stercoralis* were found in the stools. After an initial general improvement on a good diet, she developed pneumonia and died on the 18th day of admission.

The jejunum was heavily parasitized with *Strongyloides stercoralis*; adult worms, eggs and larvae were present. The surface epithelium was rarely broken but the main infection and cellular infiltration was in the submucosa; the latter showed a minimum of eosinophiles. In the colon filariform larvae were found in the mucosa, submucosa and mesentery. The surface epithelium was intact. In the mucosa, larvae were found in tissues entirely free from reaction, but in other instances there was some cellular infiltration; the cells were mainly neutrophiles but there were lymphocytes, plasma cells, histiocytes and a very few eosinophiles. In the mesentery there was no reaction. A single worm was found in the liver, but none was found in the lungs.

In the discussion the author emphasizes that in every case of auto-infection so far reported the patient has been debilitated by other infections or by malnutrition and he considers that auto-infection of persons in good health has not yet been proven.

[While it is true that absolute proof of auto-infection occurring except in a debilitated person has not as yet been provided, there is clinical evidence amounting to almost certain proof that auto-infection may in fact occur repeatedly in the otherwise healthy person; there are many hundreds, possibly thousands, of ex-prisoners of war from the Far East who 9 years after their last chance of reinfection still have a heavy *Strongyloides* infection, in many instances quite undiminished by time and therapeutic attempts at eradication. Though the present author does not seem to

suggest that the *Strongyloides* infection in his cases played any part in the death of the patients, in some of the other cases reported it was strongly suggested that this worm provided the *coup de grâce* in a debilitated patient. This fact and the extensive infiltration of the bowel wall by these worms shown in the photomicrographs in this paper provide strong support for the view that a *Strongyloides* infection is a material potential danger to the person infected.]

L. E. Napier

AKIMOTO, T., SATO, G., ABO, S., SASAMURA, M. & INOUE, N. **The Relation between the Parasitization of Ascaris lumbricoides and Abdominal Pain in Hirosaki City.** [Abstract.] *Hirosaki Med. J.* 1953, Sept. 30, v. 4, No. 3, *46. [Fuller paper in Japanese 235-9.]

The English abstract appended to the paper is as follows:—

"We carried out a mass examination on ascaris-eggs in the feces of 690 people in the central part of Hirosaki city and additionally investigated any abdominal pains of these people.

"Results obtained were as follows:

"1. The positive cases of eggs were 33.9% of all the people investigated, and these cases in patients complaining of abdominal pain were 48.8%, on the other hand in the persons with no abdominal pain were only 28.7%.

"2. The positive cases of vomiting ascaris lumbricoides were 13.2% and of excreting ascaris lumbricoides were 26.9%.

"The vomiting or excretion of ascaris has a marked correlation with abdominal pain. The rate of the vomiting and that of excretion of ascaris was 27.2% and 53.8% respectively in the patients complaining of abdominal pain, but the rates were 7.6% and 16.2% respectively in the people having no abdominal pain.

"In the patients complaining of upper abdominal pain, vomiting was found in 36.7%, which was markedly higher than that of the patients complaining of meso- and hypogastric pain.

"In the patients with colicky pain, vomiting increased to 44%.

"3. From above mentioned facts, we could assume that in Hirosaki city abdominal pain has a close relationship with ascaris infestation.

"4. 28.3% of all the examined citizens complained of abdominal pain. Among these, upper abdominal pain was commonest, counting 50.3% of the total.

"5. Of the 690 cases of the inhabitants of Hirosaki city, 7.3% complained of epigastric colicky pain. This percent was slightly higher as compared with that (5%) which was found in the villagers near Hirosaki city.

"6. Concerning abdominal pain and vomiting or excretion of ascaris, there is no marked difference between the city dwellers and the villagers who have about 2 times as much ascaride-infestation as the former. The reason, we think, is because these investigations were performed only by inquiry, so the obtained data may indicate that the ascaride-infestation in the city was much higher in the past as in the village."

RATHMELL, T. K., MORA, J. J. & VOLODKEVICH, P. **Visceral Granulomas caused by Migrating Larvae of Ascaris lumbricoides.** *Amer. J. Clin. Path.* 1954, Apr., v. 24, No. 4, 445-7, 4 figs.

The authors briefly describe the life history of *Ascaris lumbricoides* and discuss the infection of a farm worker from Puerto Rico, aged 32, who was

acutely ill with shock and died 24 hours after admission to hospital. Autopsy revealed cirrhosis of the liver, ruptured varicose veins of the lower third of the oesophagus, congestive splenomegaly, broncho-pneumonia, haemorrhage of about a litre of blood into the gastrointestinal tract and adult *A. lumbricoides* in the lumen of the small intestine, death being attributed to portal cirrhosis and rupture of the oesophageal varicose veins and to bronchopneumonia "associated with" *Ascaris* larvae. Numerous larvae of *A. lumbricoides* were found in the wall of the small intestine, pancreas, liver, lumen of the appendix and lungs. Several mediastinal lymph nodes showed stellate granulomata with central coagulation necrosis, these lesions resembling those of tularemia, lymphopathia venereum or "cat-scratch disease". Photomicrographs show *Ascaris* larvae in the lymphatic channels of the intestinal mucosa, a granuloma round a larva in the liver, an *Ascaris* larva in the lumen of a lung capillary and stellate coagulation necrosis in a perihilar lymph node, associated with "*Ascaris* pneumonitis but indistinguishable from lymphopathia venereum, cat-scratch disease, etc.". The patient's Frei reaction was unknown,

G. Lapage

MATSUNO, K. **Supplementary Report on the Histo-Pathological Information of the Change of the Liver in Bile Duct Ascariasis.** [Abstract.] *Hiro-saki Med. J.* 1953, Dec. 30, v. 4, No. 4, *64. [Fuller paper in Japanese 289-97, 14 figs. (12 refs.)]

The English abstract appended to the paper is as follows:—

"Among 169 cases of bile duct diseases operated upon in Akita Prefectural Hospital during past 3 years, there were 71 cases caused by ascaride invasion in the bile duct. Of these 71 cases 38 were living ascaride, 7 were dead body and the other 26 were so-called habitual bile duct ascariasis. KAKIZAKI already reported from the surgical clinic of Prof. T. MAKI on the histo-pathological studies about the macroscopic changed portion, so-called solitary atrophic spot, of the liver. I have performed, supplementarily, an histological examination on the liver portions that have no macroscopic change in these 71 cases of bile duct ascariasis. Results obtained as follows:

"1. Of the 38 cases with living ascaride in the bile duct, 14 cases showed histologically pathological changes in the liver taken from the portion having no macroscopic findings. All of the 7 cases with dead ascaris, and 13 cases of the 26 habitual bile duct ascariasis also revealed marked histological finding. On the whole 34 cases (47.9%) showed histologically positive findings.

"2. The chief histological change in GLISSON's capsule were, briefly, an acute cholangitis and pericholangitis causing ascending infection with round cell infiltration around the capillary bile duct. The connective tissue also increased slightly in some cases. The dilatation of the capillary bile duct was seen especially in the cases complicated with stone or dead ascaris, counting 10 cases in all. The local eosinophilia also was seen only in 10 cases contrary to the KAKIZAKI's examination about the atrophic spot of the liver.

"3. With the change of the small lobule there was noted a turbid swelling of the cells of the liver and fatty degeneration in a limited area of the central portion. These changes, in general, were seen parallel to the change of the GLISSON's capsule, but in only 3 cases was the change of the liver cells prominently observed. There were none of marked changes in GLISSON's capsule. In the other 5 cases the parenchymatous change was more intense and, to a larger extent, recognizable in comparison with the

change of GLISSON'S capsule. The cause of the parenchymatous change of these cases may not be able to be explained, I suppose, merely by the secondary effect owing to the ascending infection mentioned above."

[See also this *Bulletin*, 1953, v. 50, 324.]

KARTMAN, L. Suggestions concerning an Index of Experimental Filariasis Infection in Mosquitoes. *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 329-37, 1 fig.

The author considers the problem of how best to express the competence of a mosquito species as a vector of a filarial infection. The present paper is concerned only with the way in which data from experimental infections in the laboratory may be handled, although the over-riding importance of specific habits of mosquitoes in nature are fully recognized. The very considerable body of fact available from the author's earlier work [this *Bulletin*, 1953, v. 50, 835] is used to illustrate the theory which is put forward.

In the first place, an expression known as "host-efficiency", which was first elaborated in one of the earlier papers, is modified to take account only of third-stage larvae in the mosquito 15 days after the infecting meal. The revised expression is:

$$\text{Host efficiency ratio} = \frac{\text{Mean no. of 3rd-stage larvae per surviving mosquito}}{\text{Mean no. of mf. per mosquito in sample shortly after feeding}}$$

Some measures which might minimize the variation to which this ratio is liable are briefly indicated.

A second factor to consider is the survival rate of infected mosquitoes, which may differ from species to species. Emphasis is given, however, to the point that different species kept under identical laboratory conditions may have different mortality rates even when not infected. Experimental data are required to determine this point and to relate for each species the mortality in infected mosquitoes to the mortality in uninfected controls in a way which will permit of justifiable comparisons between species of their mortality due to infection.

The infection rate for third-stage larvae is the third element in the theory and this is given as:

$$\text{Infection rate} = \frac{\text{No. mosquitoes with 3rd-stage larvae at end of incubation}}{\text{No. surviving mosquitoes at end of incubation}}$$

[Presumably the denominator is the number of mosquitoes which were dissected; if so, when all survivors were dissected the author's wording would be appropriate but not if only a sample was dissected.] These 3 elements are then combined to provide the *Index of Experimental Infection*, viz.:-

$$(\text{survival rate}) \times (\text{infection rate}) \times (\text{host efficiency ratio}).$$

Indices of experimental infection for mosquito species, and strains, infected from one dog with an infection of *Dirofilaria immitis*, were:-0.37 for *Aëdes albopictus*, 0.23 for *Anopheles quadrimaculatus*, 0.09 for *A. freeborni*, 0.005 for *Culex fatigans*, and 0.001 for *C. pipiens* and for *Aëdes aegypti*. In geographical strains of *Aëdes aegypti* the values obtained were 0.01 (Hawaii), 0.003 (Sudan), 0.001 (South Africa and a laboratory strain of the U.S.A.) and 0.00001 (Fiji). In artificially selected strains of *Aëdes aegypti* indices varied from 0.01 and 0.02 (susceptible strains) to 0.0001 or nil (refractory strains) whereas unselected control material gave values of 0.001. The index expresses with some delicacy the relative potential as vectors of the several strains although, clearly, none is inherently as competent as *A. quadrimaculatus* or *Aëdes albopictus*.

It is important to use the same infected vertebrate host in comparing mosquito species or strains. Thus, an index of 0.18 was obtained for *A. quadrimaculatus* when infected from a dog with 16,000–18,000 microfilariae per cmm.; but the index was only 0.0005 when a much more heavily infected dog was used (30,000–34,000 mf. per cmm.). Heavy mortality, delayed development of the worms in the mosquito, and a lower host-efficiency ratio and infection rate combined to depress the index.

Although there is yet scope for further replication of experiments to assess the reliability of the index of experimental infection as a measure of vector-potential, the formula appears to be of value for comparative studies of mosquito species by compounding into a single numerical value 3 variable components which influence their efficiency as vectors. D. S. Bertram

RODHAIN, J. Les adénolymphocèles du Congo belge. [**Adenolymphoceles in the Belgian Congo**] *Inst. Roy. Colonial Belge. Sect. des Sci. Naturelles et Méd. Mémoires.* (Collection in-8°.) 1952, v. 21, No. 5, 58 pp., 1 map & 13 pls. [27 refs.]

The present study embraces observations commenced in 1936 on the histology of lymphatic glands associated with *Onchocerca volvulus* nodules from Africans in the Uele district (*An. Soc. Belge Méd. Trop.*, 1936, v. 16, 253). Having obtained material from other workers in the same locality Rodhain published in 1943 [this *Bulletin*, 1945, v. 42, 820] a preliminary study of the histology of the groin gland with adenolymphoceles. The use of this latter term was convenient as at least it served to combine together 2 different anatomo-pathological states with distinct aetiology. Since then he has obtained biopsy material derived from different parts of the Belgian Congo. During the prosecution of these studies the presence of *Wuchereria bancrofti* has been re-studied in the Congo (it was first reported by VAN CAMPENHOUT and DRYPOND'T, *Travaux du Laboratoire Médical de Léopoldville 1899–1900*: Brussels, 1901). Now FAIN found in one territory of Banningville in the district of Kwango [this *Bulletin*, 1948, v. 45, 100] that *W. bancrofti* prevailed in the absence of *O. volvulus* and that the infection was accompanied by familiar manifestations—hydroceles, elephantiasis etc., seen elsewhere. In 1947, Rodhain was able himself to visit the Bagata area, where in Basoko a focus was found by BELLEFONTAINE in which *O. volvulus* (90.74 per cent.) existed side by side with *W. bancrofti* (47.7 per cent.) [this *Bulletin*, 1950, v. 47, 259]. Material has now been obtained from 3 areas—one of pure *O. volvulus* infection; the second where the parasite coexists with *W. bancrofti*, and finally one where *W. bancrofti* alone is present.

The lymphatic glands are invariably grossly enlarged; in some this is due to hyperplasia of the connective tissue, in others of the lymphoid tissues. In some instances both processes can coexist. Tissue hyperplasia is accompanied by sclerosis of varying degrees. In this study distinction is drawn between 2 types of sclerosis. In the first, the sclerosis attains its maximum and is diffused throughout the gland; no clear differentiation can be made out between the structure of the cortex and that of the medulla. The lymphoid follicles dispersed throughout the stroma are usually reduced in numbers. Sclerosed glands of this kind are distinguished by the letters SD1; where the lymphoid tissue is preserved to a great extent they are known as SD2; but where the sclerosis, although general, preserves the general structure of the gland they are known as SD3. The second type of sclerosis consists essentially of connective tissue hyperplasia in the medulla of the gland.

The fibrous tissue which occupies the central part of the gland probably contains collagenous fibres and is known as SC. A special variety of this type, SCD3 consists of central sclerosis with trabecular extensions towards the periphery. On the other hand, hypertrophy of the gland may be accompanied by lymphatic hyperplasia and this is known as HL.

It is interesting that *Dipetalonema streptocerca* has not been found in any of this extensive series.

As the outcome of this study (26 cases in all—some of them have already been discussed in this *Bulletin*) the following conclusions have been arrived at. The first type corresponds to the true adenolymphocele in which hypertrophy of glandular tissue is moderate, resulting in lymph stasis accompanied by dilatation of lymphatic vessels. In the absence of dead adult filariae, the pathological reaction in the glandular tissue is absent. The living worms which inhabit the adjacent lymphatics do not seem to provoke any particular tissue reactions, except dilatation of the portion they occupy. Such tumours as they produce are soft and easily reducible. This is the type found in Banningville where Fain found *W. bancrofti*. The second type consists of the glands which enlarge to several centimetres and are of firm consistency. There is sclerosis of the medullary portion and the hypertrophy is a response to dead adult filariae. This is probably an allergic reaction and has its repercussion in neighbouring glands which may or may not harbour microfilariae. Therefore this state, which is still usually known as adenolymphocele, would better be designated "false adenolymphocele" due to filariasis (*W. bancrofti*). The seat is usually the groin and it affects the crural or femoral glands and may be bilateral.

The third type is formed of swellings situated just beneath the skin in the groin in which hard sclerosed ganglionic masses can be felt: the skin may be thickened and elephantoid, or it may be thin. Often the pedicle is so elongated that it extends downwards to the knees and the lower portions tend to become elephantoid. In this instance the hypertrophy of the gland is partly attributable to hyperplasia of the lymphoid tissue, but mainly to the thickness of connective tissue. This type of glandular sclerosis is found in those regions where *O. volvulus* is widely distributed. In addition to these highly characteristic glandular hypertrophies there are others which approximate in cellular pattern to those of tuberculosis, though it has not been possible to demonstrate acid-fast bacilli within them. In none of these is there any resemblance to true adenolymphocele (the photographs on Pl. VI clearly demonstrate this) and they afford testimony to Buxton's dictum that all glandular enlargements in the groin are not necessarily filarial in origin [this *Bulletin*, 1929, v. 26, 436]. The underlying reasons for the localization of these manifestations in the groin, in both sexes, remain obscure.

Philip Manson-Bahr

DAVIS, N. C. **Filarial Granuloma of Spermatic Cord.** *Med. J. Australia.*
1954, Apr. 17, v. 1, No. 16, 597-8.

This case refers to a soldier who had previously been a prisoner-of-war in Japan and had recently served in Korea. While in the latter area he developed a tender swelling in the right testicular region which proved at operation to be a lump related to the vas deferens. Microscopically, it was a granulomatous mass, having a central abscess cavity which contained "one or more apparently viable, gravid, adult female filariae". No microfilariae were found in the peripheral blood and there was no chyluria. The condition was regarded as a filarial granuloma of the spermatic cord.

H. J. O'D. Burke-Gaffney

KERSHAW, W. E. & NICHOLAS, W. L. **Studies on the Epidemiology of Filariasis in West Africa, with special reference to the British Cameroons and the Niger Delta. V.—The Intensity of Infections with *Loa loa* and with *Acanthocheilonema perstans* in the Rain-Forest, the Forest Fringe and the Mountain Grasslands of the British Cameroons, and its relation to the Incidence.** *Ann. Trop. Med. & Parasit.* 1954, Mar., v. 48, No. 1, 110-20, 2 figs. [14 refs.]

This paper should be read in association with previous papers on this subject published by these authors and their colleagues in the same journal. In two previous papers the authors considered the infections with *L. loa* and *Dipetalonema perstans* in the human population and in the insect vectors in the rain-forest, the forest fringe and the mountain grasslands of the British Cameroons [this *Bulletin*, 1954, v. 51, 709], and, under very local and artificial conditions, in a rubber plantation in the Niger Delta [KERSHAW, *ibid.*, 1952, v. 49, 888]. In the present paper the authors report the results of their investigations into the intensity of *L. loa* and *D. perstans* infections in the different age groups of the populations in the rain-forests, the forest fringe and the mountain grasslands of the British Cameroons and they have considered the relation of the intensity to the incidence in these age groups. The relationship is examined from 2 aspects; firstly, by considering how the results may bear on the mechanism of the suppression of the 2 parasites by the vertebrate host, and secondly, by trying to determine "whether the incidence of infection or the intensity of infection, or a combination of both, constitutes the most significant index of the balance struck by the parasite with the other components of the parasite-host-vector combination".

The authors' summary is as follows:—

"1. The results are recorded of investigations into the intensity of infection with *Loa loa* and with *Acanthocheilonema perstans* (as measured by the number of microfilariae in 50 c.mm. of peripheral blood) in the different age groups of the population in the rain-forest, the forest fringe and the mountain grasslands of the British Cameroons. The results obtained are compared with the incidence of the infections, and are shown to be related to each other.

"2. Factors are discussed which may affect the incidence and intensity of filarial infections as measured by the appearance of microfilariae in the peripheral blood. Such factors include the transference of the infective larvae by the fly to an individual, the load of adult worms in the individual, and the production, appearance and survival of microfilariae.

"3. In the rain-forest, the intensity of infection with *L. loa* in the human host shows no evidence of a suppressive factor which might reduce the microfilariae to some limited number. In infections with *A. perstans* the numbers of the microfilariae are suppressed until early adult life but increase with further continuous exposure.

"4. In the forest fringe, though the incidence of infection with *L. loa* falls, the intensity of the infection in infected individuals is not reduced. In infections with *A. perstans* the incidence begins to decline before that of *L. loa* and continues to do so, though at a slower rate. The intensity of infection with *A. perstans* is reduced in all age-groups.

"5. The difference in behaviour of the two definitive-host-parasite combinations is discussed, and the modes of action of the postulated suppressive mechanism are contrasted.

"6. The incidence and the intensity of the infections are considered as measures of the level at which equilibrium may be attained in differing circumstances."

R. M. Gordon

KERSHAW, W. E., CREWE, W. & BEESLEY, W. N. **Studies on the Intake of Microfilariae by their Insect Vectors, their Survival, and their Effect on the Survival of their Vectors. II.—The Intake of the Microfilariae of *Loa loa* and *Acanthocheilonema perstans* by *Chrysops* spp.** *Ann. Trop. Med. & Parasit.* 1954, Mar., v. 48, No. 1, 102-9, 2 figs.

Chrysops silacea were captured in the rain-forest near Kumba at the moment of coming to feed on man, weighed, allowed to engorge on a person, then weighed finally before dissecting out the blood meal on to a microscope slide to provide a stained specimen suitable for counting the intake of microfilariae. The human subjects serving as bait were infected with both *Loa loa* and *Dipetalonema perstans* and counts were made of the intake by *Chrysops* of microfilariae of both species of worm. Tables and charts illustrate the results obtained by examining 55 specimens of the fly, and show also the weight of blood ingested by them and the density of the infections in the peripheral blood of the human hosts. Most of the flies ingested about 30-50 mgm. of blood. In the case of *Loa loa*, the actual intake of microfilariae was very variable and lower than the expected intake regardless of the size of the blood meal; a few exceptions occurred. But, for *D. perstans*, there was much closer agreement between actual and expected intake for all sizes of blood meal. In a discussion of these different trends it is supposed that, since *Chrysops* almost certainly feeds exclusively from a haemorrhagic pool of blood in the tissues of the wound it makes [this Bulletin, 1954, v. 50, 747], the larger, slower, microfilariae of *Loa loa* passing into the pool less readily than the microfilariae of *D. perstans* are available for ingestion in lesser numbers than occur in the capillaries; with *D. perstans* these restraints are less effective and their density in the pool corresponds more closely to the numbers in the circulation. There may be, possibly, a less regular distribution of *L. loa* microfilariae in capillaries and the release of microfilariae of this species might well be influenced by the amount of laceration.

It was clear that the intake of microfilariae of *Loa loa* by an individual of *Chrysops silacea* cannot be estimated accurately by relating the size of the blood meal to the concentration of microfilariae in the peripheral blood of the human host.

A small globule of clear fluid was sometimes excreted by a fly after feeding but no microfilariae were found in this discharge. *D. S. Bertram*

JONES, Myrna F. ***Enterobius vermicularis* Infection in Patients with Poliomyelitis.** *Proc. Helminthological Soc. of Washington.* 1954, Jan., v. 21, No. 1, 15-17.

The possibility that nematode eggs or larvae might be one of the means of transmission of poliomyelitis was suggested by THOMPSON [Bulletin of Hygiene, 1949, v. 24, 389], and it has been discussed by GONZÁLES CASTRO [this Bulletin, 1950, v. 47, 1004; and Rev. Ibérica de Parasit., 1950, v. 10, 401] and by GONZÁLES CASTRO and MANAS MONTALVO (Rev. Ibérica de Parasit., 1952, v. 12, 227; and ibid., 1953, v. 13, 1).

The present author made a survey of the incidence of *Enterobius vermicularis* in 252 Negro and white patients aged up to 45 years, most of whom were 0-12 years old. The patients had either paralytic or non-paralytic poliomyelitis and all were newly admitted to hospital at Bethesda, Maryland. Study of a matched control group was not possible, but comparative data were available from an earlier survey by JONES, E. C. (*Amer. J. Dis. Children*, 1942, v. 64, 803) of children with illnesses other than poliomyelitis

and from the present author's survey (*Proc. Helminthological Soc. of Washington*, 1941, v. 8, 7) of material obtained from necropsies.

For the present survey the NIH swab was used, 1 to 7 swabs, rarely more, being taken from each patient. Examination of the Cellophane was helped by using a weak solution of the wetting agent Alconox. The results are shown in the table below, adapted from a detailed table in the text. Percentages are shown in brackets:

White	Negro	Male	Female	All Cases
43/200 (22)	7/52 (13)	33/139 (24)	17/113 (15)	50/252 (20)

Most of the patients were in the 0-12 years age group and the highest prevalence (24 per cent.) was in this group. In the older age group, more than half of whom were adults aged up to 45 years, 8 per cent. were positive. There was a lower incidence in Negroes of the younger, but not of the older, group.

Statistical analysis on the basis of "swab efficiencies" showed that the highest swab efficiency was for the white males of the 0-12 group (53 ± 4 per cent.); for other groups it was near 20 per cent. The estimated corrected prevalencies for whites, male and female, and for male Negroes of the 0-12 group were 36, 27 and 23 per cent.; for older white females it was 18 per cent.

In the earlier survey by E. C. Jones the results obtained from white children aged 0-12 years were similar, 15 out of 60 being positive, but fewer Negro children (2 out of 60) were then found positive. In the present author's necropsy series *Enterobius* was recovered from 10 out of 24 specimens from white children and from 11 out of 48 specimens obtained from Negro children. The incidence in the present group as a whole was judged to be low, because only 20 per cent. showed evidence of migrating worms and only a few seemed to be heavily parasitized; but the data showed that eggs are disseminated at times when the virus of poliomyelitis may be present in the alimentary tract. It was not possible to compare in detail the time required for the development of *Enterobius* to its egg-laying stage and the time required for the development of acute poliomyelitis. The survey included only a few cases of poliomyelitis from the same household. Of 5 pairs of these, both were positive in 2 cases, both were negative in 2 cases and in the fifth case one was positive and one negative. An experimental study of the problem is necessary.

[Evidence of the transmission of the virus of lymphocytic choriomeningitis by the larvae of *Trichinella spiralis* has been recorded by SYVERTON, McCoy and KOOMEN (*Bull. Hyg.*, 1947, v. 22, 672); and SHOPE (*J. Exp. Med.*, 1941, v. 74, 41 and 49) demonstrated the transmission of the virus of pig influenza by the larvae of the pig lungworm, *Metastrengylus elongatus*. The general problem of the possible transmission of viruses by nematode infective larvae and by the infective eggs of some species of nematodes, some of which, such as those of *Ascaris lumbricoides*, are highly-resistant and long-lived, needs careful experimental study in both man and domestic animals.]

G. Lapage

BOGNER, Wilma. Phenothiazinvergiftung durch Wurmschokolade im Kindesalter. [Phenothiazine Poisoning in Children due to Worm-Chocolate] *Med. Klin.* 1954, May 14, v. 49, No. 20, 819-21. [15 refs.]

Because the reports of poisoning due to phenothiazine in worm-chocolate increase [see also this *Bulletin*, 1954, v. 51, 624] the author reports on the

poisoning of a child, aged 2 years 9 months, with "Helmetina" worm-chocolate.

The history showed no evidence of diseases that could be related to the poisoning. In the summer of 1953, the child had "Nematalyt" for enterobiasis. In December 1953 the mother gave him "Helmetina" worm-chocolate without medical advice, giving in 4 days a total of 1·6 gm. of phenothiazine. On the last day of treatment the child became ill with vomiting, yellowish coloration of the skin and sclera, striking pallor, fatigue and a subfebrile temperature. The urine was dark brown. Two days later the child's doctor diagnosed acute haemolytic anaemia with haemoglobin 30 per cent., erythrocytes 1,210,000 and leucocytes 26,000 per cmm. In the urine there were numerous granular casts and a few leucocytes. In the clinic these findings were confirmed, the child having the typical signs of phenothiazine poisoning with marked haemolytic anaemia, icterus, albuminuria and a subfebrile temperature. After blood transfusion and other treatment the child recovered perfectly.

The author discusses in some detail various papers on phenothiazine poisoning and symptoms due either to high dosage with it or the use of various preparations. She concludes that phenothiazine must be given with great care to small children if, indeed, it is not rejected for children under 3 years old. It must be given only under medical supervision and the correct doses must be strictly adhered to. There is great danger in giving it in the form of worm chocolate, because this tastes good and looks harmless and overdoses are very easily taken, especially if this preparation can be bought without the control of a prescription.

G. Lapage

ARVIDSSON, S. O. En trichinosepidemi. [An Epidemic of Trichinosis] *Svenska Läkartidningen*. 1954, June 4, v. 51, No. 23, 1547-61. 2 figs. [15 refs.]

In the summer of 1953 a small outbreak of trichinosis occurred in Östergötland, Sweden. All the 17 patients suffered from fever lasting from 1 to 4 weeks, and from oedema of the eyelids lasting as a rule only a few days. Diarrhoea and abdominal pain were the first manifestations of the disease in all but 5 cases, and there were only 2 cases in which there was neither pain nor tenderness in the muscles of the limbs. Eosinophilia ranged from 16 to 44 per cent. and did not appear to vary with the severity of the disease. It had ceased after 4 months in all the cases in which it was investigated. The sedimentation rate was usually only slightly raised in spite of the high fever. There was only one death (from thrombosis and pulmonary embolism). All the patients had eaten meat from the same shop which had been supplied with pork from a farm in which a pig was subsequently found to suffer from trichinosis. About 1 kilometre from this farm there was a fox farm where the carcasses of the foxes killed for their pelts had been buried so superficially that they were accessible to rats. Of the two adult rats and a young rat examined, the adults were found to be infected. The comparative immunity to trichinosis enjoyed by Sweden is traced to the efficacy of its meat inspection system.

Claude Lillingston

JUÁREZ, E. Consideraciones sobre cinco epidemias de triquinosis. [Remarks on Five Outbreaks of Trichiniasis] *Rev. Sanidad e Hig. Pública*. Madrid. 1953, Jan.-Feb., v. 27, Nos. 1/2, 88-99.

These outbreaks are of value in pointing out the risks of domestic and unauthorized, and therefore uninspected, slaughtering of pigs. Two of the

outbreaks occurred in Cáceres itself, the others in surrounding districts. The province is rural and agricultural and medical men ought to be, but often are not, on the look-out for small foci and cases of less intense infection. A few remarks may be made on each of the 5 outbreaks.

1. In Cáceres, in March 1945: in this outbreak 42 known cases (23 in males, 19 in females) were seen, 23 (13 males, 10 females) of them between 20 and 40 years of age. The source was traced to sausage meat sold in the town, but obtained from a butcher some 50 km. away. There were almost certainly others affected, but with milder symptoms and not seen by the doctors. Five were seriously ill but there were no deaths.

2. In Cáceres, in January 1953: attention was first called to this by a case in a woman of 31 years. Examination of others suffering from facial oedema, myalgia, rise of temperature and with eosinophilia revealed 46 such (22 males, 24 females), but it was estimated that the number infected was about 100, for in many the symptoms were mild and many did not seek medical aid. Thirteen of the 46 lived in the Fuente Concejo district and 17 in the suburb of Casas Baratas. All were traced to eating pork sausage or black pudding made from pigs slaughtered clandestinely. None of the patients was seriously ill. In connexion with this, reference is made to 2 adults, of 16 and 24 years, infected in the same month by eating sausage made from a pig which died; the meat was found to be heavily parasitized.

3. In November 1944, in the Malpartida district of Cáceres, 12 km. from the capital, with a population of 6,104: infection was traced to sausage meat sold by a local dealer who had himself obtained it from a neighbour in Torreorgaz on 25th October previously. Sixty-two (33 males, 29 females) were attacked. Other cases had doubtless been seen in these two places, but the local doctors had diagnosed them as suffering from nephritis on account of the facial oedema. Three of the Malpartida patients died, 2 children of 3 and 4 years respectively, and a woman of 59 years, all members of the family of the man who sold the meat. Eosinophilia was not very high, 3, 5 and 15 per cent. respectively in the fatal cases.

4. In December 1947 in Santa Marta de Magasca, 30 km. from the capital, with a population of 969: it started with an outbreak of diarrhoea and fever, diagnosed as typhoid fever, as the sanitary conditions of the district were of a low order. Investigation showed 38 patients, 7 of them severely infected, with oedema, diarrhoea and intense muscle pains and contracture. Of those investigated 14 were males and 24 were females, and 14 (2 and 12 respectively) were in their second decade. There were 5 fatal cases, 2 males of 8 and 19 years, and 3 females, 16, 25 and 33 years of age; others severely infected recovered after a long convalescence. Again, the eosinophilia in the fatal cases was only moderate, 3, 5, 5, 12 and 14 per cent.

5. At Albalá in June 1948, distant 50 km. from the capital, with a population of 3,260: there were 24 persons infected, from eating undercooked meat of a pig killed privately without the knowledge of the veterinary officer. Of the 24 there were 12 of each sex, only 2 were children, aged 4 and 9 years; 2 women aged 18 and 20 years died, one and two months respectively after the onset of their illness. This outbreak afforded a good opportunity of establishing the incubation period. Symptoms started after 5 days in 3 patients; after 6 days in 1; after 7 in 4; in the same number (4) after 8 and after 10 days; after 11 days in 2; after 12 days in 1; after 14 and 15 days 3 of each [these total 25, not 24], the period varied, therefore, between 5 and 15 days.

Summing up the 5 outbreaks: the total number infected was 212 [but

these refer to definitely proved cases; the mild ones and many not seen by doctors, or misdiagnosed are not included] of whom 104 were males and 108 were females; 115 (57 males, 58 females) were in their second and third decades. The highest eosinophilia recorded was 54 per cent., but in the worst cases was less intense. There were 10 fatal cases. In spite of the laws and arrangements for meat inspection by veterinarians, much private slaughtering goes on, "to save expense". Means should be adopted for giving the people more information about the disease and of the risk of eating the flesh of privately slaughtered pigs and of insufficient cooking; doctors should be on the look-out for suspicious cases, and, though eosinophilia may be low in very severe cases, an increase above the normal may be regarded as a sign of "masked trichinosis" (*triquinosis larvada*) and should lead to further examination as to possible infection.

H. Harold Scott

LUENGO MIRÓ, E. La triquinosis ignorada en Madrid. [Unrecognized Trichiniasis in Madrid] *Rev. Sanidad e Hig. Pública*. Madrid. 1953, July-Aug., v. 27, Nos. 7/8, 448-68, 1 fig. on pl. [Numerous refs.]

The author is of opinion that there are many cases of infection by *Trichinella spiralis* in Madrid which pass unrecognized. Patients with eosinophilia are diagnosed as suffering from some allergic condition and are not investigated as carefully as they should be; if they were, he thinks that a goodly proportion of them might be mild infections by *Trichinella*. He quotes figures of infection diagnosed by examination of dead bodies in various countries—Great Britain, the United States, Germany, Uruguay, Mexico and elsewhere—and plans to do the same in Madrid and other parts of Spain and also to test as many persons as possible by an intradermal reaction with specific antigen prepared from *Trichinella* larvae. He speaks of his attempts to prepare such an antigen, but so far has not succeeded, owing to the difficulty of obtaining the flesh of heavily infected pigs; he is using white rats experimentally infected.

His examination of human autopsy material has not progressed very far. He has examined the diaphragm, the tongue and intercostal muscles of bodies *post mortem* but up to the present has only examined 32 and of these only one was found infected. [He records this as 3·2 per cent. infection.] He quotes McNAUGHT and ANDERSON who in 1936 examined 200 bodies in San Francisco and found 48 diaphragms (24 per cent.) positive [see this *Bulletin*, 1937, v. 34, 458]; he also remarks on the frequency of a low degree of eosinophilia in severe infections.

H. Harold Scott

MENDES, E. Resultado de 400 testes intradérmicos para verificação de triquinose. [Results of 400 Intradermal Tests for Trichinosis Diagnosis] *Hospital*. Rio de Janeiro. 1953, July, v. 44, No. 1, 87-9.

The English summary appended to the paper is as follows:—

"The author carried out 400 intradermal tests with trichinella extract and the results were negative. So far, trichinosis has not been found in Brazil."

GOULD, S. E., GOMBERG, H. J. & BETHELL, F. H. Control of Trichinosis by Gamma Irradiation of Pork. *J. Amer. Med. Ass.* 1954, Feb. 20, v. 154, No. 8, 653-8, 4 figs.

"The results of irradiation of trichinous pork with cobalt 60, and of a preliminary study of irradiation with waste fission material contained in old

nuclear fuel rods, agree with our previous findings on effects of Co⁶⁰ on trichinous rat meat. These results indicate that exposure of all raw pork to gamma radiation of waste fission products may be a practical means of controlling trichinosis in man and pig."

DEFICIENCY DISEASES

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE. Les Journées Scientifiques du Centre National de Coordination des Études et Recherches sur la Nutrition et l'Alimentation [TERROINE, E. F., Director]. V. Physiologie, pathologie, chimie et cytologie des foies gras. [Scientific Sessions of the National Centre for Coordination of Studies on Nutrition and Foodstuffs. V. Physiology, Pathology, Chemistry and Cytology of Fatty Liver] 24, 25 et 26 mars 1953. 404 pp., numerous figs. [Numerous refs.] 1954. Paris: 13, Quai Anatole-France.

This large book records the proceedings of a symposium held in Paris in 1953 and attended by about 100 scientists, most of whom were from the medical and veterinary faculties.

The Proceedings of some symposia, when committed to paper, make dull and difficult reading for those who were not privileged to attend. This is not the case here. The special value of this book to the reader is that the speakers have taken the trouble to add excellent bibliographies to the printed record of what they said. These sometimes extend to 200 references, which have for the most part been well chosen from the international literature with a delicate balance between the classical and the most recent papers. The volume is in 3 parts. The first deals with the experimental methods for producing fatty livers. The second is on fatty degeneration in human pathology and includes chapters on alcohol, the endocrine glands, tuberculosis and dietary factors in the tropics. The last by MORETTI reads very clearly and has a good bibliography. The third part deals with different types of fat in the liver and the mechanisms of their production. It is in part chemical and in part histological. The two final chapters by LÉVY on the metabolic changes associated with disordered liver function and by BRETON on studies of isolated cells and cell fractions are each admirable reviews.

For many years French scientists have led the field in studies of liver pathology. This excellent book rests on the sure foundations of much personal experience, and can be confidently recommended. *R. Passmore*

ADRIAENS, E. L. Note sur la composition chimique de quelques aliments mineurs indigènes du Kwango. [A Note on the Chemical Composition of Some Minor Indigenous Foods in Kwango] *Ann. Soc. Belge de Méd. Trop.* 1953, Dec. 31, v. 33, No. 6, 531-43.

In Kwango, Belgian Congo, the principal food is manioc and there is clearly a general deficiency of protein. However, at certain seasons caterpillars, crickets, molluscs, termites, grubs, fish and mushrooms are eaten in quantities sufficient to add appreciably to the calorie and protein content of the diet. This paper records the protein, fat, carbohydrate and ash content of various species belonging to these groups. The results are clearly set out and, in addition to the local names, the Latin name for each species is given. This paper may be useful for calculating the nutritive value of the diets of indigenous persons in other parts of Africa. *R. Passmore*

BERVOETS, W. P. Étude sur l'état de nutrition d'un groupe d'enfants indigènes. [A Study on the Nutritional State of a Group of Indigenous Children] *Ann. Soc. Belge de Méd. Trop.* 1953, Dec. 31, v. 33, No. 6, 545-52.

This paper records a chemical study of the blood of 55 boys aged 10 to 15 years in the Belgian Congo. The boys were apparently in good health and presented no clinical signs of deficiency disease. Total protein, albumin, globulin and *alpha*, *beta* and *gamma* globulin values were all determined. The majority of the boys had a hypoproteinaemia and after feeding for three months with 750 cc. of milk daily all the mean values rose. Ranges and standard deviations for all values are given. The rise in the level of the gamma globulins is commented on and, since these probably carry the antibodies against many infections, this may be important. The author concludes that "these children are then in a state of alimentary protein deficiency" [abstracter's translation]. [This is a deduction based solely on chemical findings. No evidence is given suggesting that higher levels of protein intake are associated with higher standards of health or better resistance to disease. Nor is the protein content of the basic diets of the children recorded.]

R. Passmore

STANIER, M. W. & THOMPSON, M. D. The Serum Protein Levels of New-born African Infants. *Arch. Dis. in Childhood.* 1954, Apr., v. 29, No. 144, 110-12. [10 refs.]

The serum protein fractions of umbilical cord blood, maternal blood and infant blood of Africans were measured by micro-electrophoresis. In comparison with the blood of white persons, significantly lower levels of albumin and β -globulin were found. The maternal African blood showed lower values for all protein fractions except γ -globulin, which was about double the value in white persons. Whereas in white persons the mean γ -globulin level of cord blood is slightly above the maternal level, in Africans it was significantly lower. The mean α - and γ -globulin levels at birth were the same as for white persons and suckling produced no increase of γ -globulin.

J. H. Birkinshaw

KENNEY, R. A. Renal Clearance of Creatinine and Urea in the West African. *Brit. Med. J.* 1954, May 15, 1130-31. [12 refs.]

Creatinine and urea clearances were determined in 10 African labourers with a protein intake of about 70 gm. per day. The creatinine clearance values were in good agreement with those commonly observed in Europeans and were unaffected by rate of urine flow. Urea clearance values were low (about two-thirds normal) and were practically unaffected by rate of urine flow. They thus failed to show the "augmentation" phenomenon characteristic of the European.

J. H. Birkinshaw

JACKSON, J. H. A Deficient Diet constituted mainly of Maize: a Discussion of its Effects with particular reference to the Eye and the Lungs. *South African Med. J.* 1954, Apr. 10, v. 28, No. 15, 305-8. [16 refs.]

This paper is a discursive and speculative account of some aspects of malnutrition arising in natives of Tanganyika subsisting on diets preponderantly made up of maize. The pathology of kerato-conjunctivitis is considered. The suggestion is made that in intensely malnourished persons the

occurrence of any specific eye lesion (trauma, infection, trachoma, phlyctenular keratitis) is likely to result in an extensive and crippling lesion. Tissue dissolution and a break-down of the eye may be precipitated by a variety of causes. In malnourished persons a condition resembling pulmonary tuberculosis, with cough and crepitations audible all over the lung fields, may be found. This may resolve completely on adequate dietary therapy. It is suggested that the physical signs in the lungs may be attributed to a pulmonary oedema arising as a result of malnutrition interfering with capillary permeability in the lungs.

R. Passmore

JELLIFFE, D. B., BRAS, G. & STUART, K. L. **Kwashiorkor and Marasmus in Jamaican Infants.** *West Indian Med. J.* 1954, Mar., v. 3, No. 1, 43-55, 5 figs. on 5 pls. [23 refs.]

Thirty-one cases are reported of which 18 were typical kwashiorkor (group a), 4 were marasmus (group c) and 9 appeared to be a mixture of both conditions, or were possibly kwashiorkor going through a marasmic stage (group b). The kwashiorkor patients (a) generally made a good and rapid recovery. Group (b) was more difficult and group (c) was least responsive to treatment.

All groups showed low total plasma proteins. The average of group (a) was 4.8 gm./100 ml. For group (b) it was 5.2 and for group (c) it was 5.7. The albumin was lowest in group (a) while the gamma globulin was highest in group (c). Fatty infiltration of the liver was most marked in the kwashiorkor group, and the fat disappeared with treatment. In every group serum cholinesterase below 0.20 unit indicated a poor prognosis.

Now that earlier and milder cases of kwashiorkor are recognized and the treatment is better understood, the prognosis is greatly improved. Enteritis, mainly due to *Salmonella*, was the most difficult complication and may have been important in the development of marasmus. Only one patient was proved to have *Ascaris*.

The article is well illustrated.

Cicely D. Williams

ADAMS, E. B. **Anaemia in Kwashiorkor.** *Brit. Med. J.* 1954, Mar. 6, 537-41, 4 figs. [26 refs.]

This study was prompted by a desire to elucidate the relationship between protein deficiency and the anaemia of kwashiorkor, and to examine the bone-marrow changes found in the disease.

Dr. Adams reviews previous work on anaemia in kwashiorkor and then describes the haematological findings in 21 cases. The patients' ages ranged from 1 to 5 years with a mean of 2 years 3 months. In each, pitting oedema, dermatosis, and lowered plasma proteins were present and in the absence of complicating disease were the only criteria used in the selection of cases. The liver was enlarged in 12 cases but the spleen was palpable in none. Ova of *Ascaris lumbricoides* were observed in 3 cases, and in one of these there were also hookworm ova. *Entamoeba histolytica* were isolated in 2 cases, but there were no dysenteric symptoms. From the low incidence of parasitic infection it can be deduced that anaemia present was not caused by such infection. Treatment consisted of administering soured milk and a hydrolysed protein preparation alternately until the child was convalescent, when ward diet was added. Eleven patients made an excellent recovery, 3 died and 7 were removed from hospital against advice and before recovery was complete. In all cases in which a complete clinical recovery occurred and in which the plasma proteins were estimated, normal values were found.

On admission the haemoglobin ranged from 4.7 to 12 gm. per 100 ml. blood, in 14 cases it was below 9 gm. per 100 ml. and in 6 it was less than 7 gm. per 100 ml. The bone-marrow in 13 cases was normoblastic, in 2 it was megaloblastic and in the remaining 6 cases it was predominantly normoblastic, but contained a few giant metamyelocytes. In some cases the nuclei of the red-cell precursors showed a finer chromatin structure than normal, and premature haemoglobinization was sometimes seen. In 11 cases the mean corpuscular volume was above 100 c μ and blood films in most showed the red cells to be large with some anisocytosis, but little poikilocytosis.

In the discussion which follows it is stated that though in experimental animals and in man suffering from starvation, anaemia is often associated with low plasma proteins, the most severe cases of anaemia in this series were not those with the lowest plasma protein values. In many a fall in haemoglobin and haematocrit levels occurred while the patient's oedema was decreasing and plasma proteins improving. Such anomalous findings, it is stated, can however probably be explained by variations in blood volume. [It is interesting to note that in those who recovered the plasma proteins also became normal.] It is pointed out that though well marked or intermediate megaloblastic changes in the bone-marrow of these patients has been found it is an unusual finding. Such cases may respond to treatment with liver extracts, vitamin B12 or folic acid, and it therefore appears probable that this feature results from a disturbance in nutrition not normally found in kwashiorkor.

[This is a noteworthy contribution to a subject in which much remains to be elucidated.]

A. W. Woodruff

SARROUY, C., SAINT-JEAN & CLAUSSÉ. L'électroencéphalogramme au cours de la dystrophie nutritionnelle oedémateuse. [The Electroencephalogram in the Course of Oedematous Nutritional Dystrophy (Kwashiorkor)] *Algérie Méd.* 1953, June, v. 57, No. 6, 584-7, 4 figs.

Electroencephalograms from 3 cases are shown alongside records from healthy control children of the same age. There are marked changes in the form of the waves, their frequency and amplitude. The frequency of the waves is much reduced, irregular in rhythm and of low voltage and this is taken as evidence of an important cerebral dysfunction. The changes persist long after the general condition is improved and the child seems clinically cured. The authors think that the return to normal of tracings taken during sleep constitute a surer test of cure than clinical tests.

[This is an important finding and not well known. It would be interesting if it were possible to correlate the EEG changes with the psychological disturbances in the disease.]

R. Passmore

DEAN, R. F. A. Treatment and Prevention of Kwashiorkor. *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 6, 767-83, 6 figs.

This is an excellent review of recent work of the author and others. The first essential in both the treatment and the prevention of this disease is a diet rich in protein (preferably animal protein to ensure an adequate supply of both vitamin B12 and essential amino-acids). For the treatment of severe cases, two high protein diets—one based on animal sources, the other of vegetable origin—are described. The first is based on dried skimmed milk and Casilan, a calcium caseinate preparation. The second is

based on soya and contains added B12. Prevention is simple in theory, but presents great practical difficulties. The best sources of protein—milk, meat and fish—are all too often too expensive for general consumption. The best possible use of plant proteins is necessary. In many parts of Africa a satisfactory mixture of soya, sunflower and maize could be obtained and this deserves extended trial.

This is a brief concise paper with practical details of the preparation of soya meal. It can be strongly recommended to physicians and dieticians charged with the care of children in Africa.

R. Passmore...

MONNEROT-DUMAINE, M. Le kwashiorkor. (Stéato-cirrhose carentielle du sevrage.) [Kwashiorkor] Reprinted from *Presse Méd.* 1954, Apr. 10, v. 62, No. 26, 545-6.

A general account and review, but without references.

SHILS, M. E. & STEWART, W. B. **Development of Portal Fatty Liver in Rats on Corn Diets; Response to Lipotropic Agents.** *Proc. Soc. Exper. Biol. & Med.* 1954, Feb., v. 85, No. 2, 298-303, 2 figs. [10 refs.]

The authors are concerned with the problem of developing the analogue of human kwashiorkor in experimental animals. With diets composed predominantly of maize they have produced in rats a fatty degeneration of the liver in which the portal areas were most affected, presenting a histological picture similar to that found in the liver of human beings with kwashiorkor. In diets of apparently similar nutritive value, but containing no maize, fat was laid down in the centre of the liver lobules rather than around the portal spaces. The authors suggest that there is some factor either present or absent in maize, which results in the formation of fat in the portal rather than in the central areas of the liver lobule.

R. Passmore

CHARMOT, G. & GIUDICELLI, P. Note sur l'étiologie des cirrhoses dakaroises. [Note on the Aetiology of the Cirrhoses of Dakar] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 185-92.

This elegant little note points out that the clinical aspects of cirrhosis of the liver in Dakar are simple enough. Ascites brings the patients to hospital and the liver is in general shrunken. It is the unknown aetiology that has drawn the attention of the medical world. A nutritional factor in the early years of life, particularly after weaning, "conditions" the liver and forms the substratum on which the cirrhosis develops in the adult. The final agent is often an infective factor and in particular the virus of infective hepatitis. The authors doubt the existence of "a malarial cirrhosis". Schistosomiasis may be a cause in hyperendemic areas, but although they have on occasions found schistosome ova in the liver, it was not possible to say that these were responsible for the cirrhosis.

R. Passmore

BRAS, G., JELLIFFE, D. B. & STUART, K. L. **Veno-Occlusive Disease of Liver with Nonportal Type of Cirrhosis, occurring in Jamaica.** *Arch. Pathology.* 1954, Apr., v. 57, No. 4, 285-300, 9 figs. [63 refs.]

The reactions of the liver to the various dietary deficiencies and toxic agents present in Jamaica continue to present new problems. In 1951 HILL,

RHODES, STAFFORD and AUB [see this *Bulletin*, 1952, v. 49, 437] described a serous hepatosis. In the early stages the potential spaces round the sinusoids and central lobular veins had become distended with an oedema-like fluid. In the present paper there is a description of the histology of 5 livers with fibrosis associated with obliteration of branches of the hepatic vein. This venous occlusion appears to be the primary feature of the microscopic picture. Figure 5 is a beautiful microphotograph showing an obliterating endophlebitis of a branch of the hepatic vein with a well-marked inflammatory reaction of the endothelium. Although the condition resembled that described by Hill and his associates in that the fibrosis appeared to begin within the centre of the lobule, there was no evidence of a serous exudation into the liver spaces. Fatty degeneration of the parenchymal cells was usually only slight and there was no evidence of a primary portal cirrhosis. The condition was thus very different from the cirrhosis usually arising from dietary deficiencies, so common in Africa and which also occurs in Jamaica.

The histological appearances of the livers are in some respects similar to those of *Senecio* (ragwort) poisoning as described in South Africa. This has drawn the authors' attention to the possibility that a vegetable toxin may be responsible for this veno-occlusive type of liver disorder. It is well known that a great variety of "bush teas" are consumed in Jamaica and that a toxic agent among one of them might be responsible for the liver damage is clearly a possibility.

R. Passmore

BRAS, G., JELLIFFE, D. B. & STUART, K. L. **Histological Observations on Hepatic Disease in Jamaican Infants and Children.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1954, Mar., v. 6, No. 1, 43-60, 8 figs. [Numerous refs.]

This paper is based on histological studies of biopsy and autopsy material from the liver. Hepatic disease has been divided in 3 groups: (1) kwashiorkor-marasmus; (2) veno-occlusive disease (*vide supra*); (3) cirrhosis. There are detailed descriptions of the microscopical findings in individual cases and a discussion of attempts to classify the various stages of the different pathological processes. [This is a paper essentially for pathologists. Veno-occlusive disease of the liver appears to be a new and important histological entity. The name is not elegant, but it is at least clear and partially descriptive. Before it is too late, may we protest against the use of the abbreviation VOD? No parents can ever have chosen so horrid a nick-name for their child.]

R. Passmore

SPRU

JIMÉNEZ DÍAZ, C., MARINA, C. & ROMEO, J. M. **Studies on the Mechanism of Steatorrhoea.** *Bull. Inst. Med. Res.* Madrid. 1953, Jan.-Mar., v. 6, No. 1, 1-12, 2 figs. [18 refs.]

Forty-four cases of "idiopathic steatorrhoea or spruelike enteritis associated with marked steatorrhoea" were studied. The patients were placed on diets containing standard quantities of fat and the fat content of stools was estimated, together with the daily calorie loss (estimated by combustion of samples of faeces). Diets contained either 30 gm. or 6 gm. of

fat in the day, and on specified days 100 gm. of fat was added "in order to test the response to overcharge".

Some patients on the low fat diets discharged an amount of fat equal to and in some cases greater than the amount ingested. An "overcharge" of fat led in many cases to increase in diarrhoea and in steatorrhoea, but not always; in some the elimination was not increased and in a few was even decreased.

The authors consider that faulty absorption cannot account for some of their findings, in which the output exceeded the intake. They conclude that steatorrhoea may sometimes arise from secretion of fatty fluid (probably chyle) from the intestinal wall and not from failure of absorption. The standard methods of determining fat absorption are carried out with diets containing so much fat that this effect is masked.

An interesting table of normal and "sprue-average" values is given for stools:

	<i>Normal</i>	<i>Sprue</i>
Fresh stools, gm.	76 294·6
Dried stools, gm.	20 43·8
Calories per day	90 211·2
Total fats per day, gm.	4·6 18·2
Fat in per cent. dried stools	25·5 41·5

B. G. Maegraith

HAEMATOLOGY

GERRITSEN, T. & WALKER, A. R. P. **The Effect of Habitually High Iron Intake on certain Blood Values in Pregnant Bantu Women.** *J. Clin. Investigation.* 1954, Jan., v. 33, No. 1, 23-6. [29 refs.]

It is here stated that though the usual haematological indices change during pregnancy, opinions differ as to the constancy or otherwise of the serum iron values. Some workers consider that a fall of serum iron during pregnancy is physiological, others regard such a fall as indicative of iron deficiency. Among members of the Bantu tribe the iron intake is often unusually high and this is indicated by abnormally high serum iron values occasionally encountered, the rarity of hypochromic anaemia and the frequency with which abnormal deposition of iron is seen in adult tissues at necropsy. In view of these considerations the authors determined various blood values and particularly serum iron levels in groups of pregnant and non-pregnant Bantu women whose everyday diet, though deficient in many respects, was characterized by a habitually high iron content. Their object was to see whether a fall in serum iron occurred in pregnancy in such women.

It was found that during pregnancy there was a significant rise in total iron binding capacity, but no significant fall in haemoglobin, haematocrit values, or serum iron.

The authors consider that the absence of the usual fall in the haemoglobin and haematocrit values during pregnancy in these women was probably brought about by their having high tissue iron reserves and an adequate iron intake. The absence of a significant change in the serum iron parallels similar findings in various studies of American women and suggests that a fall in the value is not physiological and does not occur except in women

suffering from iron deficiency. Regarding the observed increase in total iron binding capacity no explanation is offered though it is suggested that two factors may be relevant. The first is that iron is apparently transported by β_1 globulin, and secondly a reduction in the albumin-globulin ratio may occur in pregnancy. This implies that the concentration of the particular iron-binding globulin may be increased as gestation proceeds though forming only a small percentage of the total globulin fraction. A. W. Woodruff

See also p. 970, ADAMS, **Anaemia in Kwashiorkor.**

GOLDBERG, M. A. & SCHWARTZ, S. O. **Mediterranean Anemia in a Negro complicated by Pernicious Anemia of Pregnancy.** Report of a Case. *Blood.* 1954, June, v. 9, No. 6, 648-54. [30 refs.]

" 1. A case is presented of a Negro woman with Mediterranean anemia who developed megaloblastic anemia of pregnancy in each of three pregnancies.

" 2. The possibility that Mediterranean anemia predisposes to the development of pernicious anemia of pregnancy is discussed.

" 3. With megaloblastic erythropoiesis, anemia became more severe, but the characteristic red cell hypochromia of Mediterranean disease was masked.

" 4. Purified liver extract failed to protect against the development of megaloblastic anemia of pregnancy but folic acid produced a satisfactory therapeutic response."

CAREDDU, P. & VULLO, C. Risultati di indagini elettroforetiche e di prove immunitarie e di labilità colloidale nell'anemia mediterranea. [**Electrophoretic, Liver Function and Colloidal Serum Lability Tests in Cooley's Anaemia**] *Riv. Istituto Sieroterap. Ital.* 1954, Mar.-Apr., v. 29, No. 2, 182-9. [26 refs.]

The English summary appended to the paper is as follows:—

" The proteins in the blood serum of 20 children with Cooley's anemia have been studied by paper electrophoresis and by colloidal serum lability tests. A decrease of the albumins and an increase of gamma globulins, with inversion of albumins-globulins ratio, was found in most of the cases studied. The Hanger reaction was almost constantly positive while the cadmium sulphate reaction and the Mc Lagan test gave negative results. Besides, researches for hemoantibodies gave no results.

" Discussion follows on the significance of these findings."

SMITH, E., ROSENBLATT, P. & BEDO, A. V. **Sickle-Cell Anemia Crisis. Report on Seven Patients treated with Priscoline.** *J. Pediatrics.* St. Louis. 1953, Dec., v. 43, No. 6, 655-60. [16 refs.]

Although the haemolytic element in sickle-cell disease is well known, it fails to explain all the clinical findings. Thus crisis can occur in the absence of blood count change or increase in serum bilirubin. Sickling of cells has been supposed to initiate capillary stasis which in turn is followed by thrombosis and infarction. Anatomical studies generally fail to demonstrate a thrombosis sufficiently severe to explain the clinical findings. Vascular spasm has been considered an important feature of the crisis (KIMMELSTIEL, *Amer. J. Med. Sci.* 1948, v. 216, 11). The authors found Priscoline—a

vasodilator—a helpful therapeutic agent. Although the sickle-cell crisis is known to be variable and is generally self-limiting, the authors feel satisfied that Priscoline definitely shortened the period of disability in 7 children treated. They mention that a colleague treated adults in crisis with Priscoline and did not find the results as spectacular as they saw them in the 7 children. They suggest that the morphological changes in adults may have "progressed to the point where angiospastic relief is no longer obtainable". They themselves noted that Priscoline was less effective in relieving bone and joint pain than visceral pain.

Five cases are described in detail. The effect of Priscoline served as a useful diagnostic tool in differentiating the sickle-cell crisis from conditions simulating respectively: rheumatic fever, poliomyelitis, dysentery, acute encephalitis and an acute abdominal emergency. *H. Lehmann*

VENOMS AND ANTIVENENES

KUWAJIMA, Y. Immunological Researches on the Main Formosan Poisonous Snakes, especially on the Venoms. III. Pathological Changes in Rabbits due to the Experimental Inoculation of Crotalidae Snake Venoms. *Japanese J. Exper. Med.* 1953, June, v. 23, No. 3, 225-30. [10 refs.]

AMORIM, M. F. & MELLO, R. F. Intermediate Nephron Nephrosis from Snake Poisoning in Man. Histopathologic Study. *Amer. J. Path.* 1954, May-June, v. 30, No. 3, 479-99, 14 figs. on 5 pls. [42 refs.]

Brief case notes are given of 3 patients who died 3, 5 and 7 days, respectively, after being bitten by rattlesnakes. Two became anuric, the third oliguric. All apparently had haemoglobinuria and some haematuria.

The renal lesions coincided "exactly with those reported by . . . Lucké, and others under the term crush syndrome". The authors consider the lesions were of predominantly nephrotic type rather than inflammatory. They occurred in the intermediate segment of the nephron, not in the lower nephron, as suggested by Lucké. The lesions should therefore be described as "intermediate nephron nephrosis".

There is a brief and incomplete review of some of the relevant literature from which all reference to blackwater fever is omitted. *B. G. Maegraith*

MOHAMMED, A. H., ROHAYEM, H. & ZAKY, O. The Action of Scorpion Toxin on Blood Sodium and Potassium. *J. Trop. Med. & Hyg.* 1954, Apr., v. 57, No. 4, 85-7, 2 figs.

Using the Lumetron photo-electric colorimeter, the authors determined the concentration levels of sodium and potassium in the serum and red cells of the rat and the dog (number of animals unspecified) before and after the administration of 1 MLD of scorpion toxin (*Buthus quinquestriatus*) and in man 50 minutes and 2 hours after scorpion sting. After introduction of the venom the level of potassium in the serum is increased and that of sodium diminished; the opposite occurs in the erythrocyte. The authors conclude that these changes may arise from inhibition of the suprarenal cortex. They state that the "life of albino rats receiving one minimum

lethal dose of scorpion toxin could be saved by the . . . injection of either 0·5 mg./100 kg. cortisone acetate" or a similar dosage of corticotrophin.

[The details given of experiments are not sufficient to allow of any critical estimate of the methods or results.]

B. G. Maegraith

BETTINI, S. Distribuzione dei casi di latrodetismo in Italia durante gli anni 1949-51. [Distribution of Cases of Poisoning from *Latrodectus* Bite in Italy during the Years 1949-51] *Rendiconti Istituto Superiore di Sanità*. Rome. 1954, v. 17, Pt. 4, 333-42, 2 graphs & 1 map.

The English summary appended to the paper is as follows:—

"The author reports a survey on the cases of latrodetismus occurred in Italy during the years 1949-51. The total number of reported cases has been 262. The regions most heavily stricken by latrodetismus are those of the Tirrenean coast of Central Italy. The syndrome is more frequent among the workers in the fields, between 25 and 30 years of age, during the hot season (June-September). All reported cases have been treated symptomatically and no lethal cases occurred among the 262 examined cases."

GONZÁLEZ T., Lucía. *Latrodectus mactans mexicanus* subsp. nov. *An. Inst. Biol. Mexico.* 1953, v. 24, No. 2, 455-7, 1 fig. [13 refs.]

TOXOPLASMOSIS

BEVERLEY, J. K. A., BEATTIE, C. P. & ROSEMAN, Cissie. Human *Toxoplasma* Infection. *J. Hygiene.* 1954, Mar., v. 52, No. 1, 37-46, 2 figs. [50 refs.]

After a brief review of our knowledge of toxoplasmosis, the authors record the results of a survey carried out by them with the help of the dye test on inhabitants of Sheffield. The sera were obtained from blood donors, children undergoing tonsillectomy, patients attending ophthalmic departments for minor troubles and laboratory workers not dealing with toxoplasms. An analysis of variance applied to the results of the dye test showed no significant difference at a titre of 1 in 4 or more in age groups from 20 upwards, but a significant difference in the lower groups, which were therefore left out of account. In the remaining sample of the adult population the dye test revealed positive reactions in 25 per cent.

In order to detect the source of the infection, the survey with the dye test was extended to persons whose occupations involved contact with animals or meat, such as abattoir workers, veterinary surgeons, rabbit handlers (in markets) and rabbit trappers. Both the percentage of cases showing serological evidence of infection and the titres at which reactions took place were higher in this group than in the general population, in the ascending order as follows: (1) veterinarians and abattoir workers, (2) rabbit handlers, (3) rabbit trappers.

The intradermal toxoplasmin test was also used in human beings, in 340 of whom there was 94 per cent. agreement with positive reactions to the dye test.

In view of these results, dye and complement-fixation tests were performed with the sera of rabbits obtained from Wales, in 34 per cent. of which the dye test was positive to a titre of 1 in 40, and in 5 per cent. to 1 in 160.

Though the foregoing observations point to rabbits as the source of human infection, the method of transmission remains unknown.

The results of the tests are statistically analysed throughout the paper.

C. A. Hoare

VARELA, G., MARTÍNEZ RODRÍGUEZ, A. E. & TREVINO, A. Toxoplasmosis en la República Mexicana. [Toxoplasmosis in Mexico] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, Sept., v. 13, No. 3, 217-24, 2 figs. [27 refs.] English summary.

The authors report the isolation of 2 strains of *Toxoplasma gondii* in Mexico City: one was detected in a 10-month-old infant operated on for hydrocephaly, the other in a guineapig after its inoculation with an emulsion of the tick *Otobius megnini*. Both strains were successfully established in mice and guineapigs inoculated peritoneally with the cerebrospinal fluid of the child and the peritoneal exudate of the guineapig respectively.

The authors also examined directly and inoculated into numerous laboratory rodents emulsions of 104 placentae removed under aseptic conditions during parturition from women patients of a maternity hospital: in no case was the presence of toxoplasmic infection revealed.

Finally, the toxoplasmin intradermal test was carried out on 976 persons, which included 116 personnel of the institute of tropical medicine, 149 general hospital patients, 107 leprosy patients and 500 prisoners, whose ages ranged from 11 to 80 years. Positive reactions were obtained in 132 cases (over 13 per cent.).

C. A. Hoare

BRINGMANN, G. & HOLZ, J. Die Bewegungsorganellen des *Toxoplasma gondii*. [Organs of Locomotion in *Toxoplasma gondii*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 54-7, 5 figs.

Although the movements of *Toxoplasma* have already been described, the presence of locomotor organs could not be revealed either by light or electron microscopy [this *Bulletin*, 1954, v. 51, 217, 218]. Flagellum-like structures described by some observers are interpreted by the present authors as mucous filaments. In this paper they describe the minute structure of *Toxoplasma* as seen under the electron microscope. The pointed end of the ovoid parasite has the appearance of an oral opening or sucker, surrounded by basal granules, which give rise to a number of fine fibrils running back beyond the nucleus to about two-thirds of the body length. It is thought that the fibrillar system accounts for the gliding progressive movements of the parasite. Within the cytoplasm are found phosphate granules and vacuoles. The appearance of the fibrils is shown in photomicrographs and drawings.

C. A. Hoare

CHERNIN, E. & WELLER, T. H. Serial Propagation of *Toxoplasma gondii* in Roller Tube Cultures of Mouse and of Human Tissues. *Proc. Soc. Exper. Biol. & Med.* 1954, Jan., v. 85, No. 1, 68-72, 3 figs.

The authors describe the growth of *Toxoplasma gondii* in mammalian tissue cultures kept in roller tubes, following the method of ROBBINS *et al.* [*Bulletin of Hygiene*, 1953, v. 28, 586] for the cultivation of poliomyelitis virus. The walls of the roller tubes were covered with a thin layer of clotted chicken plasma into which were implanted minced fragments of embryonic mouse tissue or human tissues (foreskin, uterus, embryonic skin and muscle), with the Enders nutrient fluid medium. The cultures were

maintained at 35°C. When tissue growth was established, the primary culture was inoculated with peritoneal exudate of mice infected 3 days, while sub-cultures were made by transfers from infected tubes. The parasites used in this work belonged to 2 human strains (RH, KM) passaged through mice. The cultures were examined daily at $\times 100$.

Small numbers of extracellular parasites appeared in the medium 3–5 days after inoculation, multiplying rapidly and reaching maximum numbers between the 6th and 8th days. From haemocytometer counts it was estimated that the cultures contained up to 2·5 million organisms per ml. of medium. With the increase in the number of parasites the tissue cells in the culture underwent visible degenerative changes, terminating in fragmentation and death. The destruction of tissues, in its turn, was followed by a marked diminution of the number of parasites. The RH strain was propagated for 15 serial passages.

In the course of this study, it was confirmed that toxoplasms do not grow in the absence of living host cells, e.g., in the medium itself or when the tissue-phase was killed by heat. There was also no evidence of the production of soluble toxins by the parasites, for tissues could be grown in medium obtained from infected cultures freed of the parasites. It is noted that the parasites retained their virulence for mice after serial cultivation.

The appearance of the cultures is shown in a number of photomicrographs.

C. A. Hoare

WESTPHAL, A. & PALM, Gerda. Latente Toxoplasmainfektionen im Tierversuch als diagnostisches Hilfsmittel. II. Anwendung der Methode bei klinischen Fällen und Untersuchungen zum mikroskopischen Parasiten-nachweis. [Latent Toxoplasma Infections in Laboratory Animals as Supplementary Diagnostic Method. II. Application of the Method in Clinical Cases and Microscopical Detection of Parasites] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 61–80, 17 figs.

In a previous paper [this *Bulletin*, 1954, v. 51, 216] the authors described a method for the diagnosis of toxoplasmosis based on latent infections in experimental animals and using the dye and complement-fixation tests, as well as a histological "hamster liver test", for their detection.

In the present paper a detailed account is given of the results of the application of these methods for the diagnosis of toxoplasmosis in 115 clinical cases, comprising patients with positive serological reactions or those with characteristic symptoms of the disease or post-mortem findings. Hamsters and—in some cases—rats were used as experimental animals. In 45 cases, in which the cerebrospinal fluid of children was inoculated into hamsters, infection was revealed in 21 patients, while 24 were negative. In the case of 5 infants, various organs were inoculated into the animals, with positive results in 3 cases. In the case of 15 serologically positive adult patients suffering from multiple sclerosis, inoculation of the cerebrospinal fluid [CSF] revealed 10 infections. Positive results were also obtained in 3 out of 4 further cases of the same disease, in which the animals were fed on brain tissue of the patients, and in 6 out of 8 adult patients suffering from encephalitis, whose CSF was inoculated into animals. In 4 cases of endangiitis obliterans, the affected parts of the patients' arteries were excised and inoculated into animals, with the result that infection was revealed in 2 cases. In the case of 4 patients suffering from pneumonia, inoculation of animals with their sputum showed infection in 3 cases. Similarly, a human placenta and 1 out of 4 foetuses infected experimental

animals, while inoculation of the urine from 5 out of 9 patients, with acute clinical symptoms and positive serological reactions, also produced positive results in animals.

In the experimental hamster the latent infection is so scanty that parasites are usually undetectable, but can sometimes be found in dab smears stained by Giemsa's method, as illustrated in an accompanying photomicrograph.

The authors regard the foregoing animal tests as a valuable aid in the diagnosis of human toxoplasmosis. Though positive results were obtained in cases of multiple sclerosis and endarteritis, the rôle of the toxoplasmic infection in these diseases is not clear.

C. A. Hoare

KUNERT, H. & SCHMIDTKE, L. Zum Nachweis der Toxoplasmainfektion im Tierversuch. [Detection of Toxoplasmic Infection in Experimental Animals] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Jan., v. 5, No. 1, 58-61.

Believing that specific antibodies might be produced by dead parasites, the authors, in a previous paper [this *Bulletin*, 1953, v. 50, 855], emphasized the importance of finding toxoplasms in the body of the animals as a criterion of successful experimental infection.

In order to verify this supposition, they have applied the dye test on guineapigs and mice inoculated intraperitoneally with infected peritoneal exudate of mice, in which the parasites were killed by keeping it (a) 30 minutes at +56°C., (b) 24 hours at -18°C., or (c) 16 days at +4°C.

As the result of this treatment many of the experimental animals reacted positively to the dye test, without showing any parasites in their body. It is concluded that the production of toxoplasmic antibodies can be evoked by antigens originating in dead parasites. These observations throw doubt on some previous experiments, especially on the transmission of *Toxoplasma* by insects, the results of which were assessed solely on the basis of serological tests in the experimental mammals.

C. A. Hoare

EYLES, D. E. Serologic Response of White Rats to *Toxoplasma* Infection. *J. Parasitology.* 1954, Feb., v. 40, No. 1, 77-83, 1 fig.

In a previous paper [this *Bulletin*, 1952, v. 49, 999] the author reported that 20 per cent. of Memphis wild rats reacted positively to the dye test for toxoplasmosis but only 3 per cent. of them showed parasitological evidence of infection. In order to elucidate the significance of the positive serological reactions the dye test was carried out on experimentally infected white rats. The results of these experiments are described in the present paper.

Out of 17 young rats inoculated intraperitoneally with 5,000 to 50,000 toxoplasms isolated from a naturally infected wild rat, 13 showed parasitaemia without manifesting symptoms of disease. Before inoculation the reaction to the test was negative, but by the 4th-7th day of infection it became positive, the median peak titre of 1 in 4,000 being reached by the 15th day, then declining to 1 in 256 after 2 months and to 1 in 16 after a year. In 5 cases repeated tests carried out over 400 days (maximum 620) remained positive till the death of the animals. However, one rat behaved exceptionally, its peak titre reaching only 1 in 64 and the serological response disappearing by the 65th day after inoculation. Six months after inoculation, brain suspensions from 5 rats were inoculated into clean mice, revealing parasites in 2 cases.

From these experiments it is concluded that among the wild rats studied previously, those with positive serological reactions were probably all infected with *Toxoplasma*, while those reacting negatively had never experienced toxoplasmic infection. On the other hand, isolation of parasites from serologically negative wild rats might represent cases of early infection, before the development of the antibodies.

Lastly, failure to isolate parasites from serologically positive wild rats, finds a parallel in the negative response of some of the mice to infection with the tissues of the experimental rats mentioned above. *C. A. Hoare*

CHRISTEN A., R. & THIERMANN I., Erica. Influencia de la constitución genética en la susceptibilidad del ratón frente a la infección por *Toxoplasma gondii*. [Influence of Genetic Constitution in Susceptibility of Mice to *Toxoplasma gondii* Infection] *Bol. Informaciones Parasitarias Chilenas*. 1953, Oct.-Dec., v. 8, No. 4, 79-81.

The English summary appended to the paper is as follows:—

"The infection with *Toxoplasma gondii* ran a similar course in 15 genetically different strains of mice. The genetic constitution of the mice did not seem to be of importance in the resistance of these animals to *Toxoplasma* infection."

CHRISTEN A., R. & THIERMANN I., Erica. Investigación de toxoplasmosis en animales autóctonos chilenos. I.—*Octodon d. degus* (Molina). [Study of Toxoplasmosis in Indigenous Animals in Chile. I. *Octodon d. degus*] *Bol. Informaciones Parasitarias Chilenas*. 1953, Oct.-Dec. v. 8, No. 4, 75-7.

The English summary appended to the paper is as follows:—

"One specimen of *Octodon d. degus* an autochthonous wild rodent of Chile was found infected with *Toxoplasma gondii* and a strain of this parasite was isolated through serial transfer in *B. alb.* mice."

DERMATOLOGY AND FUNGUS DISEASES

MORAL GARCÍA, J. L. Rinosporidiosis de la conjuntiva. [Rhinosporidiosis of the Conjunctiva] *Rev. Ecuatoriana de Entom. y Parasit.* Guayaquil. 1953, Oct., v. 1, No. 4, 113-22, 2 figs. on pl. English summary.

The author summarizes the history of *Rhinosporidium seeberi* and gives a brief description of rhinosporidiosis. The world geographical distribution of the disease in man and animals is set out in 2 tables which show that of 510 cases reported in man, 233 occurred in India, 108 in Ceylon, 50 in Iran, 50 in Brazil, 17 in the United States, 14 in Argentina where the disease was originally discovered, 10 in Paraguay, 9 in South Africa and from 3 to 1 in Cuba, Uruguay, East African territories, Italy, Philippines, Siam, Malaya, Israel and Ecuador. Of 39 infections reported in animals—cattle and horses—25 occurred in India, 5 in Uruguay, 4 in Brazil, 3 in South Africa and 2 in Argentina.

Reference is made to a new case of the disease, the first to be identified in Ecuador. In this, the patient, a male agriculturist aged 40 of mixed

race, had a dull-red flat swelling on the conjunctiva of the right lower eyelid; it was of about 6 months' duration, was painless, soft and friable and measured $10 \times 6 \times 4$ mm. Microscopically it presented the characteristic features of rhinosporidiosis. The literature contains 81 earlier reports of rhinosporidiosis involving the conjunctiva. *J. T. Duncan*

CHAMPEAU, M. F. A propos des mycétomes à grains noirs de l'A. O. F. (Signification du grain). [Concerning Mycetomas with Black Grains of French West Africa. (Significance of the Grain)] *Ann. Parasit. Humaine et Comparée*. 1954, v. 29, Nos. 1/2, 135-47, 9 figs. on 5 pls.

It is generally assumed that the compact fungal colony, often of radial architecture, which forms the characteristic "grain" in mycetoma, represents a defensive form of the parasite in a hostile environment. The present author, however, does not accept this view but considers that the form and structure of the grain are determined by the surrounding tissues which enter into its composition. This conception was based on observations made on sections from 2 cases of black-grain mycetoma stained by Laidlaw's method of silver impregnation. Where the field was not obscured by masses of the dark pigment, which the author calls melanin, the deposition of silver granules, indicating the presence of reticulum fibres, could be traced into the deeper parts of the grain. These fibres appeared to be continuous with the reticular structure forming the stroma of the granuloma surrounding the grain. Channels or canals in the grain may not be mycelial structures but degenerated blood vessels identifiable by a slight deposition of silver in the vestiges of their reticulum sheaths.

The black grains present in the sinuses of the lesion are considered to have developed *in situ* from an interaction between the fungus and the granulation tissue lining the sinus. Fungi in a liquid medium are said to take advantage of even the slightest solid support offered to them to become attached, and in the sinuses the fungus, in a similar way, attaches itself to the granulomatous lining. This provokes further cytological and humoral developments including the formation of melanin which impregnates the tissue and impedes the extension of the mycelium. The black grain is thus formed and its particular morphology will be conditioned, at least to some extent, by the nature of the tissues involved.

Readers interested in this novel hypothesis are recommended to consult the original report. *J. T. Duncan*

COLSKY, J. Treatment of Systemic Blastomycosis with 2-Hydroxystilbamine. *Arch. Intern. Med.* 1954, May, v. 93, No. 5, 796/801, 3 figs. [12 refs.]

A 22-year-old United States airman, while on service in England, developed signs of an acute pulmonary disorder manifested by cough productive of rust-coloured sputum, low grade fever and increasing fatigue. Radiological and bronchoscopic examinations revealed no characteristic sign and a tentative diagnosis of viral pneumonia was made. Administration of penicillin and aureomycin caused no improvement. At a later stage, "walnut sized" granulomatous nodules with caseous centres appeared in the right vastus lateralis and on the right tendo Achillis, and the suspicion of tuberculosis was strengthened by a positive result to a second strength PPD test. Transient paralysis of the muscles of the left shoulder girdle occurred. Shortly afterwards the man returned to the United States where

sections of tissue from a biopsy on a nasolabial nodule showed the histopathological picture of blastomycosis (*Blastomyces dermatitidis*). The organism was isolated from the biopsy tissue. A radiological examination of the spine revealed a destructive process involving the bodies of the cervical vertebrae from the 4th to the 7th.

The patient was treated with 2-hydroxystilbamidine, 225 mgm. dissolved in 250 ml. of 5 per cent. dextrose solution, being given intravenously by slow drip over 45 to 60 minutes every day for 50 days. The drug was dissolved in the dextrose solution *immediately before administration*. There was no unfavourable reaction to the drug except on the 3rd and 4th days of treatment when the temperature rose to 103° and 101°F., respectively; this was presumed to be due to a modified Herxheimer reaction. The temperature declined progressively and reached the normal level on the 15th day of treatment, and a slight initial loss of weight was regained. The total dosage of 11.25 gm. seems to have effected a complete cure; the symptoms subsided, the superficial lesions healed with scarring, and radiological examinations showed healing of the vertebral lesions and complete clearing of the infiltrative process in the lungs. Trigeminal neuropathy, a frequent late complication of stilbamidine treatment, did not occur.

The warning is given that if the solution is allowed to stand, nausea and vomiting may occur.

For earlier reports on the treatment of blastomycosis with stilbamidine, see SCHOENBACH *et al.* [Bulletin of Hygiene, 1952, v. 27, 61 and 1112]. FINK *et al.* [this Bulletin, 1953, v. 50, 758], PARISER *et al.* [Bulletin of Hygiene, 1953, v. 28, 821] and CUMMINS *et al.* [this Bulletin, 1953, v. 50, 1074].

J. T. Duncan

NEGRONI, P. & DAGLIO, C. A. Estudios sobre el *Coccidioides immitis* Rixford et Gilchrist. X. Tercera contribución al conocimiento de la endemia argentina. [Studies on *Coccidioides immitis*. X. Third Contribution to the Data on Endemicity in Argentina] Rev. Inst. Malbrán. Buenos Aires. 1950-53, v. 15, No. 1, 31-2.

The English summary appended to the paper is as follows:—

"We have tested with coccidioidin 432 pulmonary patients treated at the Liga Argentina contra la Tuberculosis and we have obtained only 3.47% of positive results (10 men and 5 women), the majority of them being between 21 to 50 years of age. Nine of these people have resided in suspected zones of endemic coccidioidomycosis."

BLANK, F. & BURKE, Ruth C. Chemical Composition of the Cell Wall of *Coccidioides immitis*. [Correspondence.] Nature. 1954, May 1, v. 173, 829.

The development of a sporangium by *Coccidioides immitis* in parasitic life and also, although rarely, in saprophytic life, is generally accepted as a sufficient reason for including the species in the class of Phycomycetes and probably in the sub-class of Zygomycetes. The Zygomycetes have chitin as the "skeletal" material in their cell walls, but the Oomycetes, another sub-class of the Phycomycetes, have a cellulose cell skeleton.

Analysis of a large mass of cleaned and dried mycelium of *C. immitis* yielded the "typical powder pattern of chitin" and there were no "diffraction lines for cellulose"; nitrogen determinations confirmed these findings.

Although no conclusion of taxonomic importance can be drawn from this

result, it supports the observation that all fungi pathogenic for man and the lower animals, whether they parasitize only the skin system or also the deeper tissues, have chitin as the skeletal material of their cell walls.

J. T. Duncan

NEGRONI, P. Estudios sobre el *Coccidioides immitis* Rixford y Gilchrist.

XI—Manifestaciones cutáneas de la enfermedad de Posadas. [Studies on *Coccidioides immitis*. XI. Cutaneous Manifestations of Posada's Disease] *Rev. Inst. Malbrán*. Buenos Aires. 1950-53, v. 15, No. 2, 126-8, 6 figs. on 3 pls. [21 refs.]

The English summary appended to the paper is as follows:—

"Cutaneous manifestations of Posada's disease (coccidioidomycosis) can be of two different etiopathogenic types: (1) allergic and (2) parasitized lesions. The first ones can assume the type of erythema nodosum (4-4.6% of the total infections), erythema multiforme (2-2.6%), urticaria (2%) or erythema morbilliformis. They disappear spontaneously within a week or a month leaving a solid immunity.

"The parasitized cutaneous lesions appear, as a rule, in the course of disseminated coccidioidomycosis and can be: (1) dermoepidermic or (2) subcutaneous. The first ones frequently present the following sequence of characters: macule, papule and fungoid or cauliflower-like tumor which ulcerates.

"Subcutaneous involvement can assume the type of cold abscess, flaccid tumor or gummatus lesions. The attack of lymph-nodes of the neck, the bones and joints, can invade secondarily the skin producing the scrofulodermic type (Jacobson) or the Madura foot-type (Negroni, Fitte and Basombrio) of lesions. Allergy and acquired resistance grow weak and prognosis is unfavorable (50 to 60% fatality)."

MADDY, K. T. Coccidioidomycosis in a Sheep. *J. Amer. Vet. Med. Ass.* 1954, June, v. 124, No. 927, 465, 2 figs.

TROPICAL OPHTHALMOLOGY

DECOUR, H., FERRAND, G. & REINHARDS, J. De l'incidence sur l'évolution du trachome du traitement "de masse" des conjonctivites épidémiques par l'auréomycine à 1% en instillations. [Influence on the Development of Trachoma of Mass Treatment of Epidemic Conjunctivitis with Aureomycin Instillations] *Rev. Internat. du Trachome*. 1954, v. 31, No. 2, 119-40, 3 charts. [24 refs.]

The Moroccan Public Health Department carried out in 1952 a prophylactic treatment of acute conjunctivitis on almost 10,000 inhabitants. The treatment was aureomycin ointment 1 per cent. twice daily for 3 days every 3 weeks. One half was so treated, the other half being controls. Periodical surveys before and after each period of treatment demonstrated the following:—(1) the beneficial effect of the treatment on the epidemic; (2) the rapid action of the aureomycin which cures the conjunctivitis within 3 days; (3) the sensitivity of small children to infection and also to therapy.

Comparative observation of trachoma before treatment and after its end showed that:—(1) untreated Koch-Weeks epidemic conjunctivitis aggravates

trachoma; (2) prophylactic treatment of the epidemic conjunctivitis favours the healing of trachoma; (3) even in highly infected areas, trachoma can heal spontaneously, cicatricial trachoma appearing in untreated cases.

It is a fact that periodical conjunctivitis reactivates trachoma. Prophylaxis included in social education advising the patients to treat themselves could entirely change the epidemiological status in countries highly infected.

D. P. Choyce

GIMENO DE SANDE, A., IBÁÑEZ GONZÁLEZ, R. & LÓPEZ OLIVEROS, M.

Ensayo de lucha contra el tracoma en el litoral de Granada con aureomicina. [Campaign against Trachoma on the Granada Littoral. Use of Aureomycin] *Rev. Sanidad e Hig. Pública*. Madrid. 1953, Jan.-Feb., v. 27, Nos. 1/2, 5-28.

The author has examined schoolchildren from 4 to 13 years of age and a few adults, in towns along the Granada littoral, for infection by trachoma. The towns investigated were: Motril, 738 children (423 boys and 315 girls) in the public schools, and 701 (301 boys, 400 girls) in private schools, and 495 members of families in which infection was found; Varadero, 212 (94 boys, 118 girls) in the public schools and 144 other members of families where there was infection; 332 (163 boys, 169 girls) in the public schools of Salobreña; 92 (66 boys, 26 girls) in La Caleta and La Guardia, and 128 members of infected families in La Caleta; 643 children in Almuñécar and 202 fisherfolk; 168 children in schools of La Mamola and 67 fisherfolk, and 160 children in La Rábida.

The trachoma infections were divided into MacCallan's 3 stages: incipient, those with granulations and those with cicatrized trachoma. The details of each of these many groups are given in a series of 25 tables, stating the numbers of each sex examined, the numbers negative, and those infected in each degree. The total percentages infected are high, several ranging among the 50's—in Mamola 81 (but the total examined there was only 168) and 87 per cent. among the relatives of the schoolchildren infected. [Those interested should consult the original. It would serve no useful purpose to give the details here, because the figures as presented are so many of them wrong, or wrongly calculated, that one is led to doubt the accuracy of the rest.] With this proviso we give a rough translation of the authors' summary.

Of 8,965 persons examined 4,211 (46.9 per cent.) had trachoma in some degree, the worst sufferers being in La Mamola, 87 per cent., with La Rábida next (71 per cent.). Adults and children were almost equally affected and there was little difference between the sexes, and when any member of a family was attacked nearly all the others were almost certain to contract the infection.

Aureomycin in 1 per cent. ointment was tried in treatment and on the whole the results were fairly satisfactory: about half being cured and the cures were not only more numerous but more persistent if all members of infected families were treated. A few were treated with sulphonamides as well; Albucid and aureomycin proved successful in 10 out of 16 patients so treated in Motril, but Albucid alone cured 7 out of 15. [No mention of either the composition or strength of the preparations is made.]

H. Harold Scott

See also p. 969, JACKSON, A Deficient Diet constituted mainly of Maize: a Discussion of its Effects with particular reference to the Eye and the Lungs.

TROPICAL ULCER

LIPPARONI, E. Gli estratti placentari nel trattamento dell'ulcera tropicale. (Nota preventiva.) [Placental Extracts in the Treatment of Tropical Ulcer] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1954, Feb., v. 35, No. 2, 66-73. English summary.

An account is given of 4 cases of tropical ulcer treated with a placental extract which is manufactured under the name of "Euretin" (by Messrs. Farmaselecta of Milan). In each case, fusiform bacilli and spirochaetes had been demonstrated in the sore. One of the patients had been under treatment for the ulcer for 2 months: the other 3 ulcers are said to have set in "comparatively recently". The placental extract, which comes within the class of Filatov's "biogenic stimulins" and is known also as a "placental necro-hormone", was infiltrated into the periphery of the ulcer, one phial (2 cc.) of "strong" Euretin being injected daily at 4 different points each about 2 cm. from the edge of the ulcer. The 4 ulcers were infiltrated with a total of 24, 40, [?] 36 and 14 cc. of "strong" Euretin respectively and they all healed completely within 16, 24, 18 and 27 days from the start of this treatment; this used up the limited supply of the drug which the author had at his disposal. The sores were at the same time given such cleansing treatment as potassium permanganate compresses and simple dry dressings.

The author suggests trying the drug by local topical application or by systemic injection when more supplies are available. He has found that aureomycin in tropical ulcer gave a rapid clearing up of the infected tissues without, however, accelerating the regeneration of either connective tissue or epithelial elements: this antibiotic, moreover, has the added disadvantage of high cost. [See also this *Bulletin*, 1952, v. 49, 903.] J. Cauchi

MISCELLANEOUS DISEASES

CASTELLANI, A. **Further Observations on some Little Known Tropical and Subtropical Diseases, Internal, Surgical and Cutaneous.** pp. 1891-2182, numerous figs. 1954. Lisbon: Instituto de Medicina Tropical. [\$2.00; 60 Portuguese Escudos.]

This monograph extends the scope of a similar collection of papers published by the author in 1949 [this *Bulletin*, 1950, v. 47, 1032]. In the present volume he deals also "with a few diseases which cannot be considered tropical, and discussing also some little known clinical symptoms and signs, and some little known methods of treatment". The subject-matter is treated under the same headings as previously. Many of the sections are identical, while others contain additional material.

The principal new feature is the provision in the section "Diseases of the Skin" of 6 pages of mycological notes, describing the features and nature of fungi, together with a classification of these organisms. A very considerable number of fungi and fungous diseases is included and these additions, together with other new material, have increased the size of the monograph by some 130 pages.

The details, which consist largely of short notes and illustrative cases, do not lend themselves to abstracting and readers are referred to the original monograph for the very large amount of information set out.

H. J. O'D. Burke-Gaffney

WILKINSON, J. **The Nature and Classification of Onyalai.** *East African Med. J.* 1953, June, v. 30, No. 6, 248-50. [12 refs.]

The essential pathological feature of onyalai is now regarded as a thrombocytopenia, but it differs from idiopathic thrombocytopenic purpura in its age, sex and race incidences, geographical distribution, prodromal period and occurrence of blood bullae. Onyalai is mainly found in the Bantu race and is an acute thrombocytopenic purpura, while the idiopathic form is a syndrome divisible into acute and chronic types. Idiopathic thrombocytopenia is a disease of children and young adults and about 75 per cent. of cases occur before the age of 20. Onyalai is more a disease of the third and fourth decades of life, though possibly the disparity of numbers in the series of cases so far collected makes the comparison of little statistical value. The idiopathic form affects more females than males: of the 160 cases of onyalai recorded in the literature 111 were in males, which gives the sex ratio of 2 males to 1 female. Five cases of onyalai only have so far been recorded in non-Africans.

The idiopathic form is ubiquitous, whereas onyalai is confined to Africa or particularly to a definite part of it, bounded by the equator in the north and by the line of 28° latitude in the south, by the sea in the west and in the east by a line drawn from the Kenya highlands to the eastern border of the Rhodesias and the Transvaal. In the literature there is no mention of a prodromal period in the idiopathic form: in onyalai there is a definite one with headache, malaise, fever, pains in the parotid glands, in a period varying from a few hours to 3 days. The occurrence of blood bullae on mucous and skin surfaces is characteristic of onyalai. No case of idiopathic thrombocytopenic purpura in which these lesions were present has ever been recorded, but they may occur in secondary thrombocytopenic purpura in Europeans.

The following classification is suggested:

Thrombocytopenic Purpura:

I. idiopathic—causation unknown:

(i) without bullae = idiopathic thrombocytopenic purpura or Werlhof's disease:

(ii) with bullae = onyalai.

II. Secondary—causation unknown:

(i) without bullae: (ii) with bullae. [For previous papers on this subject by the same author, see this *Bulletin*, 1953, v. 50, 759, 854, 977.]

Philip Manson-Bahr

PATEL, B. D. **Pulmonary Eosinophilia.** (A Review.) *Indian J. of Child Health.* 1954, May, v. 3, No. 5, 237-54. [83 refs.]

FERRO-LUZZI, G. & SALZMANN, S. Tossicosi alimentari in Eritrea. [**Investigations on Food Poisoning in Eritrea**] Estratto dagli Atti I. Congr. Interregion. Estaafriano, Asmara, 30 mar.-5 apr. 1952. *Boll. Soc. Ital. di Med. e Igiene Trop. in Eritrea.* Special Number. pp. 61-7. English summary.

Food poisoning is not very common in Eritrea because the diet is monotonous and there is not the likelihood as in places where the diet is varied and the sources of poisoning are more numerous. Also, this diet is largely vegetal; poisoning by meat is rare because little meat is eaten, there are no facilities for storage and such poisoning would only occur if the meat itself were diseased.

Two types of food poisoning are due to cereals—lathyrism and lolism—and there is a third possibility, poisoning by *Argemone mexicana* [see below].

Lathyrus sativus, a vetch known locally as *seberè*, is eaten with capsicum and is regarded as harmless unless it constitutes half of the mixed cereals used for food. The symptoms, because they are not associated usually with other signs of food deficiency, except for general malnutrition, and because of the variable incubation period, are ascribed to some poison in the seeds of the vetch, not yet determined. These symptoms are those often recorded elsewhere; an incubation period ranging between 7 and 60 days (according to the quantity consumed), then a vague "out of sorts" feeling with vertigo and pain in the back, followed by general debility, stiffness of the legs and difficulty in walking, passing to clonus, tremors, spastic paresis and contracture of the thighs in flexion and fibrous ankylosis; the upper limbs escape, psychic symptoms are absent as are gross changes of sensation. There may be a mild degree of spontaneous improvement, but otherwise the symptoms are irreversible and the spastic paresis persists for life.

Lolism is "discretely diffuse" in Eritrea and Ethiopia and knowledge of it there dates from 1933 when soldiers in Somaliland fell ill with headache, giddiness, deafness and vague mental symptoms ascribed to seeds of *Lolium temulentum* imported from Abyssinia. In 1942 and 1943 an outbreak occurred at Aden and 450 cases were reported. The seed is also known as darnel, or among Abyssinians as *kirdat*, or in Arabia as *miscara*, or "seed which makes one drunk". The toxic principle was believed to be an alkaloid named *temuline* in the seed, but later investigations incriminated a symbiotic fungus, *Endoconidium temulentum*. Lolism is a mild form of poisoning of brief duration. Two cases are referred to, the patients having the previous day eaten barley cakes contaminated by *Lolium* seeds. They were in a highly excited state and rather aggressive, with a staggering, drunken gait, disordered speech and incoordination of movements. Recovery is rapid after sedative treatment.

H. Harold Scott

SALZMANN, S. Studio sulle intossicazioni da "Argemone Mexicana" in Eritrea. [**Poisoning by Argemone mexicana in Eritrea**] Estratto dagli Atti I. Congr. Interregion. Estafricano, Asmara, 30 mar.-5 apr. 1952. *Boll. Soc. Ital. di Med. e Igiene Trop. in Eritrea*. Special Number. pp. 68-77. [19 refs.] English summary.

Oedema associated with malnutrition is widespread in Eritrea since the diet of the inhabitants is ill-balanced and deficient, particularly in animal proteins, and they are consequently of poor physique and low vitality. These oedematous conditions in Eritrea have been inadequately studied and have only recently come into prominence.

The subject of the present paper has escaped notice for two reasons; first, because the plant, *Argemone mexicana*, "prickly poppy", has only recently been imported into Eritrea and, second, because there has been no outbreak to call attention to it. Epidemic dropsy has been studied in India mainly, where it was first recorded nearly 80 years ago (in 1877), but it is known to occur also in Mauritius, in Fiji and in South Africa. There is no need here to recount the symptoms, for they are well known to readers of this *Bulletin*; suffice it to say that it is a cumulative poison causing dilatation and increased permeability of the capillaries, hypoalbuminæmia and hypocalcaemia, interfering with carbohydrate metabolism, and evidenced by vomiting, diarrhoea, hepatomegaly and myocarditis with hydropericardium.

The author's investigations include ascertaining how widespread is the diffusion of the plant in Eritrea, the extent to which its oil is expressed in the factories of the country, particularly in Asmara, and to what extent it occurs as an adulterant of edible oils in Asmara. To these ends he has examined 30 samples of commercial edible oils from the factories and from retailers, especially in the native quarters of the town, but also among Europeans and from private families from which patients have been admitted to hospital on account of malnutrition and oedema, 100 samples altogether.

As results of these enquiries the author has found that the plant is growing widely, especially in the highlands, that very little is used as an adulterant of the edible oils and is found only in the cheaper grades and then not above 1 per cent.; that, so far, none of the cases of malnutrition and oedema has been definitely traced to the use of *Argemone* oil, but—and this is an important point—as the growth of the plant is increasing and the oil is cheap, it may be more and more used as an adulterant of the cheaper edible oils and, consequently, cases of poisoning by it may become more frequent, so supervision of the oil factories must be intensified.

H. Harold Scott

ANN. NEW YORK ACAD. SCI. 1952, Dec. 30, v. 55, Art. 6, 967-1284, numerous illustrations. **Use of Antibiotics in Tropical Diseases** [BROWN, H. W., Conference Chairman]. [Conference held Jan. 17, 18, and 19, 1952.]

To keep abreast of the enormous literature on the use of antibiotics in tropical diseases is almost a full-time task. This volume brings together most of that which is important in this field, and with this the reader is able to become familiar with the minimum of effort. The appearance of the work is therefore most welcome.

Thirty-three papers are published and these cover such subjects as the use of antibiotics, in rickettsial and enteric diseases, in tropical ophthalmology, bacterial diseases, protozoal infections including malaria and amoebiasis, in helminthic infections, leprosy, and spirochaetal diseases. In many of the diseases discussed antibiotics have been found to have little or no therapeutic value; it is nevertheless important to know the results of clinical trials in such diseases. Criticism might be levelled at the too optimistic views of the efficacy of some antibiotics in certain diseases such as amoebic dysentery and leprosy. The book is nevertheless very well balanced. It is certainly a comprehensive and valuable publication in this field.

A. W. Woodruff

PARASITOLOGY: GENERAL

SIMITCH, T. & PETROVITCH, Z. [Study of Intestinal Parasites in Man in Yugoslavia. Part I. Intestinal Parasites in Children from Orphanages in Banat] *Glas Srpske Akademije Nauka; Odeljenje Medicinskih Nauka*. Belgrade. 1952, v. 205 (n.s.), No. 5, 231-42. [In Serbian.] French summary.

_____, _____ & KECKAROSKA, J. [Study of Intestinal Parasites in Man in Yugoslavia. Part II. Intestinal Parasites in Children in Macedonia] *Ibid.*, 1953, v. 209 (n.s.), No. 6, 135-41. [In Serbian.] French summary.

- SIMITCH, T., GLADILIN, N., PETROVIĆ, Z. & LEPEŠ, T. [Study of Intestinal Parasites in Man in Yugoslavia. III. Intestinal Parasites of Children in Métochie, Serbia] *Ibid.*, 1953, v. 211 (n.s.), No. 7, 109-20, 1 chart. [In Serbian.] French summary.
- & LEPEŠ, T. [Study of Intestinal Parasites in Man in Yugoslavia. IV. Intestinal Parasites in Bačka] *Ibid.*, 1953, v. 211 (n.s.), No. 7, 121-32, 1 chart. [In Serbian.] French summary.
- & PETROVITCH, Z. [Study of Intestinal Parasites in Man in Yugoslavia. V. Intestinal Parasites of Primary Schoolchildren in Serbia] *Ibid.*, 1953, v. 213 (n.s.), No. 8, 83-104, 1 chart. [In Serbian.] French summary.
- , RICHTER, B., PETROVITCH, Z. & LEPEŠ, T. [Study of Intestinal Parasites in Man in Yugoslavia. VI. Intestinal Parasites of Schoolchildren in Bosnia and Hercegovina] *Ibid.*, 1953, v. 213 (n.s.), No. 8, 105-21, 2 charts. [In Serbian.] French summary.
- , —, —, — & —. [Study of Intestinal Parasites in Man in Yugoslavia. VII. Intestinal Parasites of Schoolchildren in Dalmatia] *Ibid.*, 1953, v. 213 (n.s.), No. 8, 123-33, 1 chart. [In Serbian.] French summary.

Most of these studies were carried out on schoolchildren, whose stools were examined by direct, concentration, and cultural methods. Over 4,600 specimens were examined; the numbers for Banat, Macedonia, Métochie, Bačka, Serbia, Bosnia and Hercegovina, and Dalmatia, were 232, 412, 543, 370, 1319, 988 and 691 respectively.

The results are shown in very great detail in numerous tables and charts presented in Serbian, but it is clear that very high rates of infection with helminthic and protozoan parasites were found in general: for example, *Ascaris*, *Enterobius* and *Trichuris*, sometimes reached 70 to 80 per cent., *E. histolytica*, 30 to 40 per cent. and *Giardia* and *Trichomonas*, 20 to 30 per cent. There was, however, considerable regional variation.

H. J. O'D. Burke-Gaffney

DI PRIMIO, R. Recuperação sanitária e elevação do nível econômico da zona malarígena de Torres. [Improvement of Sanitation and Raising the Economic Level in the Malarious Zone of Torres, Brazil] *Rev. Med. Rio Grande do Sul*. 1953, Nov.-Dec., v. 10, No. 56, 50-56.

Torres has always been regarded as an endemic focus of malaria. The general backward state of the people is ascribed partly to this, partly to widespread helminthic infection, partly to general poverty and a low state of education (*analfabetismo*). The present contribution speaks of these in general terms; except for a hookworm campaign by the Rockefeller Foundation which came to an end some years ago, little has been done. Of late years a local service has been instituted to deal with malaria (the use of DDT), hookworm (the wearing of shoes), together with general raising of education and reduction of poverty. The commonest helminthic infection was by *Ascaris lumbricoides*, *Nectator americanus* and *Trichuris trichiura* in association; next the first and third of these, and then the first and second. *Ascaris* is thus very common. *Hymenolepis nana* and *Strongyloides stercoralis* are seen occasionally, but the fact that of 215 faecal examinations among schoolchildren only 2 were negative indicates how common helminthiasis is, and the ages at which infection is most rife

are between 10 and 12 years. No figures are given of the prevalence of malaria, or of the type of infection. In short, the subject is dealt with on very general lines.

H. Harold Scott

CHANDLER, A. C. **Immunity in Parasitic Diseases.** *J. Egyptian Med. Ass.* 1953, v. 36, No. 12, 811-35. [48 refs.]

The author discusses immunity arising in the vertebrate host after contact with (a) protozoa, (b) arthropods and (c) helminths, and he emphasizes that the phenomenon is not the result of stimulus by a single antigen but by a mosaic of them each producing a separate antibody. An important group in parasitic diseases is probably that which interferes with the metabolism of the organism by anti-enzyme action. This is clearly the case in rats infected with *Trypanosoma lewisi* and *duttoni*: a reproduction-inhibiting antibody (ablastin) begins to appear on the 6th day of infection, more is present by the 10th, still more on the 28th, but the amount declines after the 35th day. Like most or all antibodies, ablastin is associated with the globulin fraction of the plasma, and its production is retarded by splenectomy or reticulo-endothelial blockade of the host.

With arthropods, such as *Cordylobia* larvae or *Sarcoptes*, the immune process is confined at first to a limited area of the skin, and with the mite, growth and reproduction are inhibited much in the same way as with the protozoa. Arthropod bites also cause a local immune reaction, which first interferes with the feeding, then reduces irritation and finally deflects the arthropod from biting at all. In helminth infections, the first antigenic stimulus comes from the parenteral passage of the larva, and this alone may cause cessation of growth of the intestinal form; but the adult in the intestine is also capable of giving rise to antibodies. The effect is seen in (a) stunting of growth, (b) retardation of development, (c) inhibition of reproduction, (d) elimination of worms and (e) refractoriness to reinfection.

All these examples of immunity are probably reactions to metabolic products produced by the parasite, though this cannot be directly proved in the case of protozoa. The immunity is of a low order and usually of short duration.

P. C. C. Garnham

ENTOMOLOGY AND INSECTICIDES: GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

ALLINGTON, H. V. & ALLINGTON, R. R. **Insect Bites.** *J. Amer. Med. Ass.* 1954, May 15, v. 155, No. 3, 240-47.

This review, which ably summarizes recent work by many investigators, but which does not set out to describe original observations, is intended to help physicians to deal with problems relating to insects which they find in their practices. It catalogues the insects and arachnids which commonly attack man in the United States, giving notes to assist in diagnosing the cause of the trouble and on destroying the insects which are responsible. The skin reactions to bites and the process of sensitization and immunization are discussed.

The authors refer to many authorities in their paper, but no references are published. This is explained by the editor, who states that they have

been omitted "because of lack of space" (though they will appear in the authors' reprints). It is to be hoped that other editors will not follow this example, for without the references this review loses much of its value.

Kenneth Mellanby

HAMON, J. Contribution à l'étude des culicides de la région de Bamako (Soudan français). [**Study of Mosquitoes in the Bamako Region, French Sudan**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 1, 178-85. [16 refs.]

As a result of a mosquito collecting trip around Bamako, French Sudan, in 1953 the author is able to add to the list of local mosquitoes 8 species of *Anopheles* (*brunnipes*, *domicolus*, *flavicosta*, *leesonii*, *pretoriensis*, *rhodesiensis*, *rivulorum*, *wellcomei*) and 9 Culicines. Breeding places, statistics of relative prevalence and other notes are given.

H. S. Leeson

LA CASSE, W. J. & YAMAGUTI, S. **Mosquito Fauna of Japan and Korea.** 3rd Edition. [2+] viii + 268 + 7 + 213 pp., 96 pls., 94 figs. & 51 maps. [33 refs.] Multigraph. 1950. Kyoto, Honshu, Off. Surg., 8th U.S. Army [& Washington, D.C., Off. Surg. Gen. U.S. Army]. [Summary taken from *Rev. Applied Entom.* Ser. B. 1954, Mar., v. 42, Pt. 3, 33.]

This is the third and enlarged edition of a work of which the previous editions had a more or less restricted circulation. The main part comprises descriptions of the adults, and larvae where known, of the mosquitos of Japan and Korea, with brief notes on their biology, and their relation to disease if evidence is available. Illustrations of the characters of the adults of all but one of the species and of the larvae and pupae of most of them are included. With very few exceptions, synonymy is not considered, but the CULICINI include one new species described in the present edition from larvae, the adult being unknown, and another species and a variety that were first described in the second edition (1948). *Anopheles edwardsi* Yam. is considered a subspecies of *A. koreicus* Yam. & Watan.; both are recorded from Hokkaido, Honshu and Kyushu and *edwardsi* also from Korea, and larvae of both were sometimes present in the same breeding place. The characters supposed to differentiate the adults and larvae were found to intergrade.

There are two separately paged appendices. The characters of the female terminalia differentiating the subgenera are described in the first, and the second is essentially a compilation of data obtained in the field during the occupation of Japan by the U.S. army, when much attention was being devoted to the risks of mosquito-borne diseases and particularly Japanese B encephalitis. It is divided into sections concerned, respectively, with: the organisation and functions of malaria survey detachments; survey methods and technique (including the processing of mosquitos for virus isolation); temperature and precipitation during the six months when mosquitos are active at Kyoto, Honshu; the hibernating habits of mosquitos; the species of mosquitos occurring in Korea; the more important sources of mosquito breeding that were observed during routine surveys in Japan; mosquito control in Japan (principally by the use of DDT against adults and larvae); mosquito-borne diseases in Japan (malaria, dengue fever, filariasis caused by *Wuchereria bancrofti* and Japanese B encephalitis); studies on mosquito bionomics, temperature and rainfall and their probable relationship to Japanese B encephalitis from which it was concluded that no correlation can be found between outbreaks of the disease and rainfall or temperature;

and finally studies on the biology of *Culex tritaeniorhynchus* Giles, one of the most abundant and widely distributed of the mosquitos found in Japan and probably an important vector of Japanese B encephalitis.

BROWN, J. H. The Mosquito Problem in relation to Irrigation Developments in Alberta. *Canadian J. Pub. Health.* 1954, Mar., v. 45, No. 3, 93-9. [18 refs.]

In Alberta, Canada, south of the Red Deer River, there are 485,000 acres of ground under irrigation and 89,000 people live there. In 5 years' time these figures are expected to be increased by another 465,000 acres and 47,900 population.

The mosquitoes in this region have come to be regarded as an occupational hazard but they are a real health problem. There are 7 species of *Aëdes*, 2 *Anopheles*, 1 *Culex* and 1 *Culiseta*. It is well known that the mosquito plagues reduce the efficiency of man and animal but it is not so well known that the virus of encephalomyelitis is carried by *Aëdes dorsalis*, *nigromaculis*, *vexans*, *Culex tarsalis* and *Culiseta inornata*.

Recommendations are therefore made concerning (1) the planning, construction and maintenance of existing and future reservoirs, ditches, laterals, spillways and drainage, (2) an intensive education programme to teach the economic uses of water, and (3) the establishment of a mosquito survey and control organization as part of the administration.

H. S. Leeson

CALLOT, J. Le rapport trompe/palpes dans les biotypes du complexe *Culex pipiens* et leurs hybrides. [**The Relationship between Proboscis and Maxillary Palp Length in Biotypes of the Culex pipiens Complex and their Hybrids**] *Ann. Parasit. Humaine et Comparée.* 1954, v. 29, Nos. 1/2, 131-4.

Measurements of the length of the proboscis and of the maxillary palps of *Culex pipiens* and *Culex autogenicus* (= *molestus*) and their hybrids have been made and the value of this ratio as a distinguishing character is discussed.

Eighty-five per cent. of the male *Culex pipiens* measured showed that the 4th segment of the palps extended beyond the tip of the labium. Ninety per cent. of the male *Culex autogenicus* showed the proboscis extending beyond the 4th segment of the palps.

The hybrids of the 1st generation showed the proboscis longer than, equal to, and shorter than the palps in an equal number of cases.

Anne Hudson

SENEVET, G. & ANDARELLI, L. Présence près de Biskra (Algérie) de *Culex pusillus* (Macquart, 1850). [**Presence of Culex pusillus near Biskra, Algeria**] *Arch. Inst. Pasteur d'Algérie.* 1954, Mar., v. 32, No. 1, 33-5, 1 fig.

MONCHADSKII, A. S. [**Mosquito Attack on Man under the Natural Conditions of the Subarctic and Factors regulating it**] *Parasit. Sborn.* Moscow. 1950, v. 12, 123-66, 6 graphs. [52 refs.] [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1954, Mar., v. 42, Pt. 3, 46.]

Blood-sucking Diptera are very troublesome in the Arctic zone of the Soviet Union, and a study of the species concerned and the factors that

affect their activity was carried out in June–August in 1946 and 1947 at a latitude of $67^{\circ}30'N.$ on the high left bank of the Pechora, in an environment of tundra covered with shrubs. Collections were made mainly by means of a bell-shaped cover that was lowered over the author after he had sat in the open for five minutes at various times of the day and night. Mosquitos were far the most numerous and aggressive of the Diptera thus collected. Simuliids were much less active, and Ceratopogonids and Tabanids were scarce. The mosquitos taken under the cover comprised five species of *Aëdes*, of which *A. punctor* (Kirby) and *A. communis* (Deg.) predominated. Their numbers reached a peak in mid-July and began to decrease after about a fortnight, the decrease becoming progressively more rapid as the season advanced and the weather became less favourable.

The effects of meteorological conditions on the behaviour of the mosquitos are discussed at length. Temperature was the main factor affecting attack, which took place between 3.5 and $29^{\circ}C.$ [38.3 – $84.2^{\circ}F.$] and was most intense between 9 and $24^{\circ}C.$ [48.2 – $75.2^{\circ}F.$]. Light and wind were also important, bright light with an intensity of over 40 thousand lux having a marked depressing effect on activity, whereas a decrease in intensity below 1,500 lux had a stimulating effect, especially if the decrease was rapid. A wind of over 3.4 miles per hour was unfavourable, and attacks practically ceased when it reached 6.7 miles per hour. Differences in relative humidity between 35 and 100 per cent., changes in atmospheric pressure, and moderate rain had no effect on the mosquitos, but dew condensing on their body surfaces and heavy rain or prolonged drizzle with mist, sharply reduced activity.

In favourable weather, attacks continued without ceasing by day or night. On warm days in July, when the sun did not set, the peaks were in the morning and evening and the minimum at night. In cold weather, the peak occurred during the day, and there was no attack at night. In August, when the nights became dark, attack was intense from the evening until midnight when there was no dew and at a minimum during the day, particularly when the temperature was high and the light bright. With the onset of cold weather, attacks occurred only by day.

KELLER, J. C., CHAPMAN, H. C. & LABRECQUE, G. C. **Tests with Granulated Insecticides for the Control of Salt-Marsh Mosquito Larvae.** *Mosquito News.* 1954, Mar., v. 14, No. 1, 5–9.

Aerial sprays of insecticides were found to be ineffective against salt-marsh mosquito larvae, *Aëdes taeniorhynchus* and *Aëdes sollicitans* in Florida, because they do not penetrate the dense vegetation cover. However, in 1951, WHITEHEAD (*Arkansas Agr. Expt. Sta. Bull.* 1951, 511) found out that this problem could be overcome by applying bentonite pellets coated with the larvicides. In view of this, field tests were conducted in Brevard County, Florida, to determine whether greater efficiency could be obtained with insecticides on granular carriers.

Preliminary hand application tests were conducted on small plots with lindane, dieldrin, heptachlor, chlordane, TEPP and parathion on granular bentonite, in comparison with emulsions of the same insecticides. A table of results showed that parathion, heptachlor and dieldrin gave nearly complete kills at a dosage of 0.025 lb./acre both in granulated forms and in emulsions. Lindane at 0.05 and chlordane at 0.1 lb./acre gave similar results, but TEPP even at 0.1 lb./acre gave only 31 per cent. reduction. Further hand application tests were made to compare the relative efficiency

of granulated dieldrin, heptachlor, EPN, chlordane, or DDT as toxicants and attapulgite or bentonite as carriers. Results in a second table showed that EPN was most effective at a 0·025 lb./acre, followed by heptachlor, dieldrin and chlordane at 0·05 and 0·1 lb./acre. DDT at 0·1 lb./acre gave relatively poor results. All of the insecticides tested gave better results with bentonite than with attapulgite at the aforementioned dosages, but at lower dosages no clear-cut difference between the two carriers was noticed.

Large-scale tests with aerial application of insecticides on typical pickleweed salt marshes were made to compare the effectiveness of the insecticides with bentonite, attapulgite and tobacco stems as carriers at a dosage ranging from 1–5 lb./acre of granules and 0·05–0·2 lb./acre of toxicant. At 0·05 lb./acre, EPN, parathion and heptachlor on bentonite gave nearly complete kills and were slightly more effective than dieldrin or BHC on bentonite or BHC on tobacco stems. Toxaphene and aldrin at 0·1 and malathion at 0·2 lb./acre on bentonite gave reductions of 89, 87 and 88 per cent., respectively. At 0·2 lb., chlordane and DDT gave 81 and 76 per cent. reduction, respectively. Heptachlor on bentonite was more effective than on attapulgite, and dieldrin was completely ineffective on attapulgite.

In a final discussion, the authors say that their tests indicated that aerial application of granulated insecticides in salt marshes with dense vegetation is twice as effective as spraying because it ensures better penetration.

[However, the data given in this paper do not seem to the abstracter to justify this conclusion or to indicate that granular application is any better than spraying.]

G. R. Shidrawi

SUDIA, W. D. **The Effect of Flowing Water on Mortality Rates of *Aedes aegypti* (L.) Larvae.** *Ohio J. Sci.* 1952, v. 52, No. 2, 76–9. [Summary taken from *Rev. Applied Entom.* Ser. B. 1954, Mar., v. 42, Pt. 3, 33–4.]

The effect of flowing water on the development of larvae of *Aedes aegypti* (L.) was studied in the laboratory by leaving batches of 25 larvae for 4–72 hours in tanks of water flowing at different rates while a control batch was exposed in still water in otherwise identical conditions. The larvae were five days old at the beginning of the test and were then kept until the adults emerged. The mortality percentages were estimated from the numbers of adults obtained. It was found that whereas the duration of exposure in the jar of still water did not affect mortality, which was always about 6 per cent., the percentages were invariably higher in flowing water and increased with the velocity and with the duration of exposure in it. It was calculated from the figures obtained that 50 per cent. mortality would result from exposure in water flowing at 0·5, 1, 2, 3 and 4 ft. per second for 60–70, 60–72, and less than 8, 4 and 4 hours, respectively.

HAFEZ, M. **On the Behavior and Sensory Physiology of the House-Fly Larva, *Musca domestica* L. II. Prepupating Stage.** Reprinted from *J. Exper. Zool.* 1953, Nov., v. 124, No. 2, 199–225, 11 figs. [31 refs.]

The reaction of the prepupating larvae of the house-fly to humidity, temperature and smell is studied in a circular arena divided into two halves [this *Bulletin*, 1951, v. 48, 294]. The results obtained are compared with similar data for the feeding stage larvae.

Humidity [Comparative data for feeding larva in brackets]. The prepupating larva has a humidity preferendum of 50–60 per cent. RH, and

sensitivity to change of humidity falls rapidly outside this range. However, the late larva is much less sensitive to humidity changes than the feeding stage (which has a humidity preferendum of about 100 per cent. RH).

It is shown that the probable hygroreceptors throughout larval life are the tufted thoracic sense organs.

All larval stages exhibit sensory adaptation to adverse conditions of humidity, and also of temperature, and the orientation mechanisms concerned are the same for both humidity and temperature.

Neither stage shows any effect of preconditioning to either factor.

Temperature. Preferred range lies between 8°C. and 20°C., and sensitivity to temperature changes decreases rapidly below the lower end of this range. [The thermal preferendum of the feeding larva is between 15°C. and 33°C.]. Both larval stages strongly avoid higher temperatures; in the case of the prepupating larva high temperatures slow down movement and seem to induce the onset of pupation (in contrast to the feeding larva where higher temperatures increase the speed of locomotion).

Smell. The prepupating larva has a very much reduced sensitivity to odours than the feeding stage. The late larva shows a weak avoidance of acetic acid and faecal odours. Ammonia produces no response.

[The feeding larva is strongly attracted by the smell of dung and of ammonia, and is strongly repelled by the smell of acetic acid.]

The above findings are discussed and correlated with the behaviour of the two larval stages in the natural environment. D. M. Minter

PEFFLY, R. L. **Effects of some Environmental Factors on the Biology of *Musca domestica vicina* Macq.** *J. Egyptian Pub. Health Ass.* 1953, v. 28, Nos. 8/9, 157-66, 1 fig. [10 refs.]

Tests were undertaken at the U.S. Naval Medical Research Unit No. 3, Cairo, to contribute more information on the biology of *Musca domestica vicina*. The effect on development of varying moisture content in larval breeding material, the effect of temperature on oviposition and on incubation periods and the time of day at which the maximum number of flies emerge, were investigated.

Larvae were found to mature in media containing between 40 and 70 per cent. moisture, values between 60 and 70 per cent. produced twice as many flies as 40 per cent. Sizes of emerging flies were compared by measuring the presutural portion of the mesonotum.

Oviposition occurred at all temperatures between 18.5°C. and 43.5°C. but not at 12.5°C. or 46.5°C. The most effective range lay between 24°C. and 42°C. The incubation period for eggs was shorter at higher temperatures.

The maximum number of flies emerged between 6 a.m. and 12 noon and it is suggested that space-spray applications made to Egyptian villages after 10 or 11 a.m. should give a more effective control. Anne Hudson

PEFFLY, R. L. **A Summary of Recent Studies on House Flies in Egypt.** *J. Egyptian Pub. Health Ass.* 1953, v. 28, Nos. 1/2, 55-74, 2 figs. [19 refs.]

These investigations include a survey of fly populations in Egyptian villages, a study of their biology and methods of control.

Eleven species or subspecies of *Musca* occur in lower Egypt [this *Bulletin*, 1953, v. 50, 257], the most prevalent being *M. domestica vicina* and *Musca*

sorbens. Normally *M. d. vicina* is predominant indoors and out of doors but in summer *M. sorbens* becomes more abundant in certain localities. The mean monthly temperature around Cairo ranges from 50°C.-90°C., which is favourable for fly development all the year round. The fly density is greatest in April, May, June, September and October. An interesting difference between *M. d. vicina* and *M. domestica* was shown by eggs of *M. d. vicina* hatching at temperatures which were fatal to *M. domestica*. Under average Egyptian conditions development of *M. d. vicina* from egg to adult takes from 9-10 days.

The principal types of fly-breeding areas in Egyptian villages were classified by HOLWAY *et al.*, [this *Bulletin*, 1952, v. 49, 729] as latrine dumps, compost piles, animal rooms, fuel cakes (consisting of buffalo dung, straw, dry leaves, twigs and bits of corn stalks) and human faeces. These latrine dumps are placed outside houses and animal houses and exist because there are no adequate sewage or garbage collection systems. *Musca sorbens* breeds mostly in human faeces and *Musca domestica vicina* in latrine dumps, compost piles and animal rooms. Estimates of larvae breeding in various material revealed 70 per cent. bred in human faeces and fuel cakes.

In tests with various insecticides, water suspensions of DDT and dieldrin and kerosene solutions of chlordane were compared. Chlordane was more effective than either of the other two; it caused an immediate 90 per cent. reduction which lasted 8-16 weeks. Chlordane at 100 mgm./sq. ft. sprayed on to walls, ceilings and floors of all buildings in a village gave a control of 90 per cent. to begin with, but at the end of 8 months became less effective.

Foliage of trees and shrubs, used as night resting places by flies was sprayed in summer with DDT suspension. The fly population was reduced by about one-third in 7 weeks.

One year after the first application of BHC flies began to become resistant, and 3 years after application of BHC and chlordane flies became highly resistant to both. It was therefore imperative to consider control in terms of basic sanitation.

Removal of waste material, the installation of bored-hole latrines, adequate drainage, and the spreading of fresh manure in a 2-inch layer in the sun or by scattering over the fields were some of the methods suggested. Fuel cakes made from fresh dung were found unsuitable for larval development.

The use of chemicals in controlling larvae and adults is discussed. Applications of BHC and chlordane to larval breeding places as dust and sprays have been found successful in Egypt, also pyrethrum sprays containing piperonyl butoxide or some other chemical which increases the effectiveness. The work has shown that the use of larvicides applied in certain breeding places is more effective and cheaper than surface applications in places where adult flies are frequently found. Anne Hudson

PEFFLY, R. L. The Relative Importance Different Fly-Breeding Materials in an Egyptian Village. *J. Egyptian Pub. Health Ass.* 1953, v. 28, Nos. 8/9, 167-80.

This paper gives a detailed account of the different types of breeding materials present in an Egyptian village and enlarges on the results shown in a previous paper by this author [see above]. Quantitative estimates of the percentage of the total fly population produced by each type of material are given for the different seasons. Tests were run to determine the attractiveness of various faecal materials to *Musca sorbens* and *Musca*

domestica vicina, the predominant species, also rearing tests to estimate the length of time required for larval development. Laboratory tests showed that *M. d. vicina* prefers horse dung to 7 other kinds of animal excrement and *M. sorbens* prefers human faeces. It was shown that larval populations were highest in all materials during spring and lowest in summer and winter.

Anne Hudson

GAHAN, J. B. Residual Toxicity of some New Insecticides to House Flies under Conditions prevalent in Egypt. *J. Egyptian Pub. Health Ass.* 1953, v. 28, Nos. 8/9, 181-96, 7 figs. [10 refs.]

Laboratory and village tests were conducted in Egypt against *Musca domestica vicina* on bricks and surfaces made out of a mixture of clay, straw, manure and water of which the majority of rural houses in Egypt are constructed.

In the laboratory tests adults were exposed at intervals of 4 weeks to surfaces of bricks treated each with dieldrin, chlordane, methoxychlor, aldrin, DDT and BHC. Exposure was carried out by two methods—first by exposing mixed sexes for 2 hours and taking counts of mortality after 24 hours: the second method was by exposing each time a group of 20 females continuously and recording the time required to produce 60, 90 and 100 per cent. knock down at a dosage of 200 mgm./sq. ft.

In one experimental series, chlordane outlasted methoxychlor and DDT, but in the knock-down tests it was inferior to both of them. A previous experiment had indicated that combinations of methoxychlor and DDT have a synergic action when used as residual applications, but now a second series of experiments which was conducted for this purpose proved the contrary and that combinations of methoxychlor-chlordane, DDT-methoxychlor and DDT-chlordane were no more effective than at least one of their components used singly. Later, a comparative experiment on wettable powder sprays of dieldrin, at various concentrations, and chlordane at 200 mgm./sq. ft. showed that dieldrin was more durable at 25 mgm. and gave a more rapid knock down at 100 and 200 mgm. than chlordane at 200 mgm. Also it was found that residues obtained with DDT wettable powder suspensions were better than those obtained with emulsions or kerosene solutions, but the choice of carriers used in spraying chlordane and dieldrin did not appear to be of importance at such high dosage of 200 mgm./sq. ft. Another minor experiment showed that the *gamma* isomer of BHC at 100 mgm. was better than DDT at 200 mgm., in the mortality tests, and at 50 mgm. was more durable.

In the village tests, insecticides were applied directly to inside walls, ceilings, furniture and all other surfaces of the houses. Two villages were treated with chlordane, 2 with dieldrin and 3 with DDT. None of the villages contained more than 15 houses. The results, which are given in 7 figures, show that over 90 per cent. reductions in both chlordane treatments were recorded after the first 48 hours and infestations were still low after 4 months. Treatments with dieldrin gave a reduction of 73-77 per cent. within 10 days after the insecticide had been applied and remained at that level for 4 weeks after which counts were discontinued. Treatments with DDT gave a noticeable reduction in only one of the 3 villages treated and the maximum reduction was not attained until 7 weeks after spraying.

In a final discussion, the author reviews the work of other investigators with insecticides on other types of surfaces and compares their results with his own. He concludes that dieldrin, chlordane, BHC, methoxychlor and

aldrin appear to be promising for use on dried clay surfaces of such types of rural houses. The order of efficiency is not well emphasized as such.

G. R. Shidrawi

GAHAN, J. B. Studies with Chlordane Sprays to control House Flies in Egyptian Villages. *J. Egyptian Pub. Health Ass.* 1953, v. 28, Nos. 8/9, 197-210. 2 figs.

Having obtained a better control of *Musca domestica vicina* with chlordane than with DDT in small Egyptian villages in 1949, the author has conducted a larger scale experiment with the same insecticide in 1950 in 2 large villages. One of the villages was treated between March 28th and April 21st with 5 per cent. chlordane at the rate of 160 mgm./sq. ft. all over the walls, ceilings, and floors of every house as well as the breeding areas outside the houses to determine the degree of control that could be obtained by one such complete treatment. On June 12-13 the floors only of the second village were treated to find out if a satisfactory control could be obtained by this partial spray as it was observed that house-flies congregate mainly on the floors and occasionally land on the walls or ceilings. For each of the two treated villages there was an untreated village kept as a control. In all the villages, houses were constructed mainly from a combination of clay, straw, and manure. Periodic changes in the density of house-flies in treated and untreated villages were measured by counting the flies on a wooden grill of the Scudder design (1947).

The complete treatment of the first village had considerable effect on fly prevalence for at least 8 months. A 75 per cent. reduction or more was maintained for 6 months and during the first 17 weeks it reached at least 90 per cent.

To test any fumigant effect of chlordane, laboratory-reared house-flies were exposed in clean cages in some of the treated houses for 2 hours and records of survival were taken after 24 hours. The results showed that a considerable kill occurred during April, May and June. As a further test of effectiveness, other laboratory-reared flies that had been stained with phenolphthalein were released in May in the completely treated village and the corresponding untreated control village. The following day, collections made from both villages showed that the number of stained flies recaptured in the untreated village were 4-5 times the number recaptured in the treated one, which indicated that a great proportion of these flies were killed within 24 hours in the treated village. Later on, in January 1951, laboratory tests that were carried out against the first generation progeny of *M. d. vicina* adults collected in the previously treated village indicated that some resistance to chlordane had been developed.

In the village where the floors only were treated, a 48 per cent. reduction in the fly index below the fly density for the corresponding untreated village was noticed within 3 days after treatment. By the second week the difference between them reached at least 75 per cent. and remained like that for a period of 4 months. During 17 weeks, the difference was 83 per cent. or above reaching a peak of 89-90 per cent.

Finally, in discussion, the author concludes that there is no economically feasible method by which house-flies can be eliminated from Egypt. However, a chlordane spray during the springtime should give a high degree of control for 4-5 months, and a second in September or October may be needed in some places to obtain satisfactory protection during the autumn. Treatment of floors only is a useful procedure if complete spraying of internal walls, etc., is impracticable for economic or other reasons.

G. R. Shidrawi

DELONG, D. M. & BOUSH, G. M. **Is the Housefly being replaced by other Diptera as the Major Insect Pest of Food Markets?** *Ohio J. Sci.* 1952, v. 52, No. 4, 217-18. [Summary taken from *Rev. Applied Entom. Ser. B.* 1954, Apr., v. 42, Pt. 4, 63.]

Observations made in towns and cities in Ohio, New York, Pennsylvania, West Virginia and Illinois over a period of three years indicated that, contrary to general belief, flies other than *Musca domestica* L. are dominant in food markets. Data are given on the species composition of 16 samples of dead flies swept up from window ledges following treatment of food shops in 16 towns in Ohio with insecticidal fogs in July-September 1951. There were 3,018 flies in all, of which 66.1 per cent. were *Lucilia (Phaenicia) sericata* (Mg.), 28.9 per cent. *M. domestica* and 5 per cent. *Phormia regina* (Mg.). *M. domestica* comprised over 50 per cent. of only one sample, over 40 per cent. of four others and less than 7 per cent. of three.

GREEN, A. A.; KANE, Joyce. **The Control of Blowflies infesting Slaughter-Houses. I. Field Observations of the Habits of Blowflies** [GREEN]. *Ann. Applied Biol.* 1951, June, v. 38, No. 2, 475-94. [26 refs.] **II. Large Scale Experiments** [GREEN]. *Ibid.*, 1953, Dec., v. 40, No. 4, 705-16. **III. Large-Scale Experiments at a Domestic-Refuse Depot** [GREEN & KANE]. *Ibid.*, 1954, v. 41, No. 1, 165-73, 1 text fig. & 2 figs. on pl. [15 refs.]

This work has been carried out over a number of years. It describes studies made on the biology of several species of blowflies which infest slaughter-houses and the subsequent application of control methods.

Twenty-two slaughter-houses in 12 counties in England were visited and these showed little uniformity in design, varying in the number of rooms and in the amount of surrounding waste ground. Where space was limited and collection of waste material was infrequent, excellent conditions prevailed for the rapid development of flies. The chief genera concerned were *Calliphora*, *Lucilia* and *Phormia*. *Musca domestica* was present in small numbers using the refuse piles as breeding grounds but rarely entering the slaughter-houses. The nature of the fly populations changed with the season and the movement of flies was dependent both on weather conditions and on the local working conditions. It was therefore difficult to estimate overall population densities. It was shown that sunlight had a very great effect upon the behaviour of blowflies, and that the need to oviposit seemed to act as a stimulus reversing the normal reaction; a preference for certain types of meat and certain parts of the carcass by adult flies was noticed.

Observations on the migration of larvae showed that this takes place largely at night and that mass movement does not appear to be related to extremes of temperature, either inside or outside the food. Experiments carried out in complete darkness (*i.e.* day and night) seemed to show that some factor other than light causes the larvae to migrate at night. Under favourable conditions the pupation period may be as little as 4 days.

The slaughter-house refuse was found to support very dense populations of larvae, for example, 1 cwt. might successfully raise 200,000 larvae, and under favourable conditions of temperature larvae of *Lucilia* and *Phormia* can become fully grown and migrate within 3 days of oviposition. Larvae of *Lucilia* seemed unable to compete with those of other genera and it appeared that *Phormia* larvae were predaceous on other species inhabiting the same breeding material. Comparative rates of development under

conditions of natural competition of *Phormia*, *Lucilia* and *Calliphora* are shown:—

Period in days for development of first adults		
<i>Phormia</i>	<i>Lucilia</i>	<i>Calliphora</i>
9 days	13 days	19 days
16 „	19 „	22 „
16 „	17 „	21 „

All information obtained seemed to show that blowflies spend the winter as fully grown larvae which pupate only a short while before emergence. Adults of *Calliphora erythrocephala* and *Calliphora vomitoria* were found to be active for the greater part of the year, the larval hibernation period was from 5–6 months and oviposition continued until late autumn. With *Lucilia* spp. the larval hibernation period was from 6–7 months and oviposition took place until October. No blowflies appeared to overwinter beneath refuse or within refuse itself. It seems unlikely that the flies overwinter as adults in England.

These observations on the habits of blowflies suggested various methods of control which have been given extensive trial at a large, heavily infested abattoir situated in a densely populated built-up area. Immediately behind was an area of waste ground overgrown with grass and weeds which acted as resting places for flies.

Treatment of breeding places by admixture of the larvicide orthodichlorbenzene with refuse was found to be ineffective as the liquid was only fatal when in actual contact with the insects and it could not be distributed evenly enough to obtain a good larval kill. It was found that surface treatment of refuse with DDT and BHC dusts, DDT and pyrethrin sprays and DDT emulsion was effective, but only when carried out daily. Sprays containing pyrethrin were more effective against visiting flies. In the case of larval infestation, DDT dust and emulsion treatments were the most effective. BHC dust gave a good kill of adult flies but was less effective than DDT in reducing larval infestation.

It was found that treatment of vegetation could be done with: (1) an aqueous dispersion of DDT wettable powder and (2) a 5 per cent. DDT dust. Spray and dust were applied at about 375 and 200 mgm. DDT/sq. ft. area, respectively. Either of these methods could be used without fear of repelling flies to areas difficult to locate.

A rotational scheme for the collection of waste material was organized, together with other improvements in hygiene.

As a result of continuing these measures for 3 consecutive summers, infestations of larvae were virtually eliminated. Where unskilled labour was used the degree of control was reduced, but under conditions of normal practice blowfly population can be kept at a comparatively low level.

The investigation was extended to cover other breeding grounds, and the final paper describes extensive trials at a heavily infested sorting and disposal depot. About 400–700 tons of domestic refuse are received here daily from the London boroughs. During the summer large numbers of migrating blowfly larvae occurred in the ballast of the railway tracks and emerging adults caused considerable nuisance over the surrounding district. The infestation was caused by larvae, which had been collected in the refuse from domestic bins, falling through the cracks in the wagon boards, sometimes at rates of 7,200 per hour per wagon. They burrowed into the top 2 inches of soil usually within 20 ft. of the rails.

It was decided to treat the surface of the ground at railway sidings with

DDT or BHC dusts or emulsions. A method was devised for estimating the efficacy of various insecticidal treatments by trapping emerging adults.

Results showed that with the DDT treatment a high proportion of larvae died in the soil whereas with BHC treatments the majority of dead larvae were on the surface of the ground. With both insecticides many larvae which pupated failed to emerge.

In all instances DDT gave better control of larval and pupal stages than corresponding BHC treatments, dusts were more effective than emulsions and frequent applications of small quantities of dust were slightly more effective than heavy applications at long intervals. DDT dust applied twice weekly was estimated to have killed 79·7 per cent. of larvae and pupae and 95 per cent. of emerging adults: the overall control was 99·1 per cent.

The methods used by laboratory staff were later applied by employees of the local authority and the degree of control was at least as good as that obtained under experimental conditions.

At the end of the second season after heavy and widespread use of DDT, blowflies showed no increased resistance.

Anne Hudson

KANO, R. Notes on the Flies of Medical Importance in Japan. Part VIII. Descriptions of *Sarcophaga uganskii* (Rohdendorf, 1937) and Two New Species of *Sarcophaga* from Tokyo. Japanese J. Exper. Med. 1953, June, v. 23, No. 3, 255-68, 52 figs. [42 refs.]

SIMITCH, T. & JIVKOVITCH, V. Faune des phlébotomes en Yougoslavie. (Les phlébotomes de la Macédoine, de la Serbie méridionale et de la région "Kosovo" et "Métohia".) I Partie. [**Observations on Phlebotomus and Distribution in Yugoslavia**] Bull. Acad. Serbe des Sci. Belgrade. 1951, v. 3 (n.s.), Classe Sci. Méd., No. 1, 31-4.

_____, GVOZDENOVITCH, M. & KOSTITCH, D. Contribution à la connaissance de la faune des phlébotomes de Yougoslavie. (Les phlébotomes du Monténégro.) II Partie. *Ibid.*, 35.

_____, NEŽITCH, E. & TARTALJA, P. (Les phlébotomes de Dalmatie.) III Partie. *Ibid.*, 37.

_____. Contribution à la connaissance des phlébotomes en Yougoslavie. (Deux phlébotomes du groupe *minutus*.) IV Partie. *Ibid.*, 39-41.

JIVKOVITCH, V. *Phlebotomus sergenti* Parrot, 1917 en Serbie. V Partie. *Ibid.*, 105.

_____. (Serbie de l'est, de l'ouest et du nord.) V Partie. *Ibid.*, 107-8.

SIMITCH, T., KOSTITCH, D., JIVKOVITCH, V. & NEŽITCH, E. Faune de phlébotomes de Vojvodina, Bosnie, Herzégovine, Dalmatie du nord et Istrie. VI Partie. *Ibid.*, 109-10.

_____. La faune des phlébotomes en Yougoslavie. L'étendue des espèces des phlébotomes et leur proportion de répartition dans les différentes régions du pays. VII Partie. *Ibid.*, 125-32.

ŽIVKOVIĆ, Vera. [Study of *Simulium* in Yugoslavia] *Glas Srpske Akademije Nauka; Odeljenje Medicinskih Nauka.* Belgrade. 1952, v. 205 (n.s.), No. 5, 9-36, 33 figs. [30 refs.] [In Serbian.] French summary.

_____. [Presence of Eggs of *Simulium columbaczense* in Nature] *Glas Srpske Akademije Nauka; Odeljenje Medicinskih Nauka.* Belgrade. 1953, v. 209 (n.s.), No. 6, 29-34. [31 refs.] [In Serbian.] French summary.

_____. [Experimental Study of the Length of the Embryonic Cycle in *Simulium salopiense* and *S. columbaczense*] *Glas Srpske Akademije Nauka; Odeljenje Medicinskih Nauka.* Belgrade. 1953, v. 209 (n.s.), No. 6, 35-42, 1 chart. [15 refs.] [In Serbian.] French summary.

SAILER, R. I. **The Blackfly Problem in Alaska.** *Mosquito News.* 1953, Dec., v. 13, No. 4, 232-5.

Even though as many as 36 species of blackflies have been recorded from Alaska, there have been few records of their actually biting man; however, they do cause a certain amount of annoyance by hovering over people's heads and crawling over their faces. In the course of 3 survey trips undertaken by the author in June, July and August-September 1948, observations on blackflies were made in 200 localities. During June considerable numbers of *Simulium vittatum* and a large population consisting mostly of *S. venustum* and *S. tuberosum* were seen. In July and August the predominant species was *S. venustum* although *S. tuberosum*, *S. decorum*, *S. aureum* and *S. vittatum* were also observed. During the survey, members of the party received only very few bites, though several people who were actually or presumably bitten by blackflies were interviewed. The predominance of different species during the different months was observed in many other localities also; some species like *S. arcticum* and *S. corbis* were confined to the lowlands while others like *Prosimulium hirtipes* and *P. fulvum* were common in mountains.

Observations made on the activity and aggressiveness of blackflies showed that the behaviour of the same species of blackfly in the autumn was different from that in summer; thus in late September and early October blackflies engaged in much crawling and probing before they actually bit, but by the middle of October biting was direct. A higher temperature induced an increased landing count. In one of the localities no activity was observed when the temperature was below 51°F., but at 59°F. blackflies were continuously present and ready to bite. The author points out that at present no definite explanations can be given for some of the contradictory observations recorded in the paper; for example, the aggressive biting tendency of *S. venustum* in one of the survey areas and the lack of biting records for this species in other parts of Alaska, or the behaviour of species like *S. arcticum*, *S. corbis* or *Prosimulium hirtipes* which have only a nuisance value during the summer but which start biting in autumn when temperatures are well below those necessary for flight activity; the first observation could be explained by the fact that the interior of Alaska has been thinly populated by human beings but has an abundant wild life, while the particular area where *S. venustum* was biting man had been a fair-sized village for several hundreds of years.

In conclusion the author states that with the increasing expansion of

settlers over Alaska and the consequent destruction of wild life, the blackflies would become a major problem, as they will then have to turn to human beings and domestic animals for food.

M. G. R. Varma

DIMOND, J. B. & HART, W. G. Notes on the Blackflies (Simuliidae) of Rhode Island. *Mosquito News.* 1953, Dec., v. 13, No. 4, 238-42.

Studies on the geographical distribution, seasonal abundance and ecology of blackflies in Rhode Island were made by the authors during 1952. Some of the specimens were reared in the laboratory to obtain series of life history stages to facilitate identification. Of about 10 species collected from the various localities, the most abundant was *Prosimulium hirtipes*, which even though biting man only occasionally caused a good deal of annoyance by hovering above the head and landing on the skin. This species was the only one found in streams which dry up during the summer. It overwintered in the larval stage and had one generation a year, while some other species had more than one. Trout fishermen were the principal sufferers as the trout season in Rhode Island closely parallels the blackfly season. In the case of *P. hirtipes*, half-grown larvae were most prevalent during early February; most larvae were mature by April, pupation occurring in mid-April. Adults emerged and had virtually disappeared by late May. Although no eggs were found, it was presumed that this species spent the summer and autumn in this stage. Two species preferring the same type of stream for breeding resulted in definite larval associations, as when *P. hirtipes* and *Cnephia mutata* were found breeding together. *Simulium vittatum* bred alone during winter but was found in association with *S. venustum* in summer.

Apart from their nuisance value, blackflies in Rhode Island do not reach the economic importance that they do in some other parts of America.

M. G. R. Varma

LEÓN, L. A. & WYGODZINSKY, P. Los simúlidos del Ecuador y su importancia en medicina tropical (Diptera Simuliidae). [Simuliidae of Ecuador and their Medical Importance] *Rev. Ecuatoriana de Entom. y Parasit.* Guayaquil. 1953, Oct., v. 1, No. 4, 23-39, 7 figs. [19 refs.] English summary.

A brief historical account of work on the Simuliidae of Ecuador is followed by a key to the 8 species known in that country, namely, *Simulium exiguum*, *S. jujuyense*, *S. riveti*, *S. escomeli*, *S. quadrivittatum*, *S. dinellii*, *S. ignescens* and *S. equadoriensis*. The first 4 species are recorded as voracious feeders on man and, except for *S. jujuyense*, also on animals. A single indigenous case of onchocerciasis of man is here recorded. *S. riveti* and *S. exiguum* are abundant where the disease mal de pinto, or carate, occurs. The authors suppose that this distribution implies that these 2 species transmit the infection.

D. S. Bertram

THERRIEN, A. A., HUNTER, G. W., MOON, A. P. & ADAMS, A. L. Tests of Potential Acaricides against the Lone Star Tick. *J. Econom. Entom.* 1954, Feb., v. 47, No. 1, 76-8.

"In the summer of 1952 plot tests of various materials against the lone star tick were carried out at Camp Bullis, Texas. Results indicate that

ieldrin applied as a dust at 1 pound per acre is more effective in controlling the lone star tick, *Amblyomma americanum* (L.), than any of the other chemicals tested."

MILLER, A. **Dung Beetles (Coleoptera, Scarabaeidae) and other Insects in relation to Human Feces in a Hookworm Area of Southern Georgia.** *Amer. J. Trop. Med. & Hyg.* 1954, Mar., v. 3, No. 2, 372-89, 21 figs. on pl. [14 refs.]

The author gives an account of the fate of human faeces deposited on the surface of the ground in regions of the South-eastern States of the U.S.A. during the summer months where such deposition is not uncommon among rural populations. In such areas human stools are seldom in evidence on the surface but are rapidly removed or buried by various insects, chiefly Coleoptera. Observations of stools placed on the ground, and study of collections made by means of faeces-baited traps, show that in the area studied, stools may disappear from the surface in as short a time as 75 minutes, leaving only a patch of disturbed soil. It is established that the principal agents are beetles, of which the Scarabaeidae constitute 89 per cent. (Altogether 74 species of Arthropods are recorded as occurring in association with human faeces in this study; 46 of these are regarded as coprophilic, the others mainly parasitic or predatory.) Adult Diptera and Dipterous maggots are unimportant as agents for disposal, although occurring in large numbers. The Scarabaeidae present are divisible into two groups: first, species of *Canthon*—locally known as "tumble bugs" which remove faeces in the form of balls, some 6-25 millimetres in diameter, which are rolled away and buried at a distance (up to 20 ft. or more). These "tumble bugs" made up two-thirds of all the beetles collected, and are active chiefly by day. The second group of important Scarabaeidae were the "burying beetles", such as species of *Onthophagus*, *Phanaeus* and others. These are active mainly by night and bury the faeces *in situ* down to a depth of 23 centimetres or so.

The amount of faeces that can be removed by dung beetles, and the rate of removal, depend very much on geographical, climatic, and seasonal factors; also on local circumstances. Such factors influence the numbers and kinds of insects present in a given area, and hence their importance as agents of disposal of human faeces. In parts of the area studied, calculations show that the beetle population of about one-fifth of an acre is capable of removing the daily excrement of 4-6 persons, or some 750 gm. daily. Of this quantity of faeces, about two-thirds would be buried at a distance from the site of deposition, and the remaining third on the spot.

The rapid burial and dispersal of faeces in this manner is regarded as of possible significance in the epidemiology of hookworm infections; both as regards the survival of eggs and larvae in the buried faeces, and in the insects feeding upon it; and as regards an influence on the degree of pollution and worm infestation of soil by maintaining defaecation sites in acceptable condition for repeated visits, thus enhancing the infection potential of particular localities.

D. M. Minter

VAN ASPEREN, K. & OPPENOORTH, F. J. **Metabolism of Gamma-Benzene Hexachloride in the Animal Body.** [Correspondence.] *Nature.* 1954, May 22, v. 173, 1000.

The metabolism of gamma BHC was investigated in an attempt to understand the defence mechanisms of animals against this insecticide. A

method of quantitative assay of the insecticide in animal tissues was devised, involving the dechlorination of BHC to benzene by means of zinc dust in acetic acid, nitration of benzene to dinitrobenzene and colorimetric determination of the violet-red reaction product of this compound with methyl ethyl ketone and alkali.

In a series of tests with closely related substances only the 4 principal isomers of BHC and benzene gave a positive reaction, and very little colour was obtained in control analyses on the tissues of untreated animals.

The breakdown of *gamma* BHC was found to be rapid in albino mice injected subcutaneously, intravenously, or intraperitoneally with the insecticide. All the toxicant had disappeared within 24 hours after intravenous injection of 200 µgm. of *gamma* BHC in peanut oil-Ringer emulsion. The breakdown of *gamma* BHC was also found to be rapid in resistant houseflies. The nature of the metabolites of *gamma* BHC, however, is unknown. Further work will involve a study of the correlation between the symptoms of intoxication and metabolism after administration of different isomers of BHC.

C. Mary Harrison

OPPENORTH, F. J. Metabolism of Gamma-Benzene Hexachloride in Susceptible and Resistant Houseflies. [Correspondence.] *Nature*. 1954, May 22, v. 173, 1000-1001, 1 fig.

The metabolism of *gamma* benzene hexachloride (BHC) was studied in 3 house-fly strains, 2 strains being resistant to *gamma* BHC (one of these was also resistant to DDT) while the third strain was susceptible. Individual flies were injected with 0·03 µgm. of *gamma* BHC in 0·3 cmm. of peanut oil emulsion. No *gamma* BHC was excreted and therefore any decrease in the amount in the flies indicated that metabolism was taking place. *Gamma* BHC was metabolized rapidly by the resistant strains of flies. Metabolism started in the non-resistant flies but was slower and stopped after approximately 4 hours. It should be noted, however, that death occurred within a few hours in this strain.

Experiments in which the abdomens were cut off flies 30 minutes after injection demonstrated that metabolism was taking place in both the thorax and abdomen, but it also seemed probable that the insecticide was being stored in the body fat of the abdomen. It is still not clear whether the difference in breakdown of the insecticide in the resistant and susceptible strains is the cause of resistance, but experiments are in progress to determine the rate of metabolism of the insecticide at concentrations at which both the resistant and susceptible flies will survive. C. Mary Harrison

DAHM, P. A. Radioactive Tracers in Insecticide Research. Part I. Soap. New York. 1953, Sept., v. 29, No. 9, 186-9, 161. **Part II.** *Ibid.*, Oct., No. 10, 148-53, 163-5. **Part III.** *Ibid.*, Nov., No. 11, 141-7, 165. **Part IV.** *Ibid.*, Dec., No. 12, 167-8, 175, 8 figs. [Numerous refs.]

These articles survey the use of radio-active tracers in insecticide research and give a very adequate review of the literature on this subject. The first part is devoted to definitions and explanations of the basic principles of radio-active isotopes. Radio-active isotopes are stated to be unstable atoms continuously undergoing a process of atomic disintegration or decay to stable atoms by the liberation of *alpha*, *beta* and *gamma* rays. A small

quantity of a radio-isotope may be used to follow a biological process and is then known as a radio-active tracer. Since stable and radio-active isotopes of an element have essentially the same chemical properties the behaviour of stable atoms can be traced by following the radio-activity.

Radio-isotopes may be useful as sources of radiation or as tracer atoms. In insecticide research they have been useful as sources of radiation for autoradiography, and as a source of gamma rays for catalysing the chlorination of benzene. As tracer atoms they have been used in insecticide research in distribution and mode of action studies, isotope dilution analyses, chromatography, and neutron activation of paper chromatograms.

Section II contains a table of the radio-isotope-labelled insecticides that have been prepared with references to the mode of preparation and uses. This table is divided into the (1) synthetic organic insecticides (subdivided into the halogenated hydrocarbons and the organic phosphates, (2) fumigants, (3) insecticides derived from plants, (4) inorganic insecticides and (5) miscellaneous. The use of radio-active substances in each of these groups of insecticides is then discussed and the literature reviewed.

It has been found, for instance, that when DDT labelled with ^{14}C was applied topically to cockroaches the radio-activity was distributed extensively throughout the internal tissues and organs. Studies with ^{14}C labelled DDT on DDT-resistant house-flies showed that a relatively small proportion (18 per cent.) of the DDT applied topically penetrated into the body. Of the absorbed DDT in surviving flies, 63 per cent. was non-toxic and therefore was metabolized. Similarly in DDT-susceptible flies approximately the same percentage of DDT which penetrated the cuticle was metabolized to a non-toxic product. Other experiments in which D^{82}BrDT [the radio-active ^{82}Br . analogue of DDT] was used showed that this compound was metabolized only by DDT-resistant flies but the metabolism was insufficiently rapid to account for resistance.

Yet other workers synthesized and used ^{32}P -labelled diethylphosphoric acid in studies on penetration, distribution, and metabolism of organic phosphates in the American cockroach. Experiments in which ^{32}P -labelled DFP was used suggest that the mode of action of this insecticide may differ from other phosphate insecticides, such as TEPP, where there is an inhibition of cholinesterase by the phosphate esters.

A large section is given to a discussion of the systemic insecticides, tracing the insecticides through plants, and to plant-feeding insects.

It is suggested that it should be possible through the use of labelled compounds to discover more about the penetration, persistence and toxicity of each of the compounds in a typical insecticide formulation.

C. Mary Harrison

LABORATORY PROCEDURES

JASWANT SINGH, RAY, A. P. & NAIR, C. P. **J. S. B. Stain—its Preparation in the Powder Form and the Staining Technique.** *Indian J. Malariology.* 1953, Sept., v. 7, No. 3, 267-70. [12 refs.]

Slight modifications in the preparation and use of the JSB stain are described [see also this *Bulletin*, 1944, v. 41, 822; 1948, v. 45, 1124]. The polychromed methylene blue is now prepared as a powder and mixed with solid disodium hydrogen phosphate for storage in small specimen tubes.

The technique of staining is altered by dipping the smear first in eosin for 1-2 seconds, then in wash water (pH 6.2 to 6.6), then in the methylene blue for 40-45 seconds and finally in the buffered water for 3 or 4 dips. The authors point out that the stain is one-fiftieth the cost of Giemsa and is at least as effective.

P. C. C. Garnham

KAMAHORA, J., INAMORI, K., FURUSAWA, E. & MORI, T. **A Cytochemical Study on the Mechanism of the Giemsa Staining and the Nature of Azure Granules.** *Med. J. Osaka Univ.* 1953, Nov., v. 4, Nos. 2/3, 235-40. [19 refs.]

LEVINE, N. D. & MARQUARDT, W. C. **A Simple Technic for obtaining Egg and Serum Slants Free of Bubbles.** *Amer. J. Trop. Med. & Hyg.* 1954, Jan., v. 3, No. 1, 195-6.

A method is described for obtaining egg or serum slants in culture media free of bubbles. After the test-tubes are filled with 2 ml. amounts of the fluid medium, they are placed upright in a vacuum desiccator, which is evacuated slowly, releasing the air bubbles from the mixture. After evacuation is stopped, the tubes are left in the desiccator for an hour, when the vacuum is released, and the tubes slanted in the autoclave, inspissated and sterilized at 15 lb. for 20 minutes.

C. A. Hoare

MISCELLANEOUS PAPERS

GAUD, J. Climatologie et épidémiologie au Maroc. [**Climatology and Epidemiology in Morocco**] *Maroc Méd.* 1953, Nov., v. 32, No. 342, 1187-93, 4 figs.

Although there are many diseases in Morocco which are strange to France—malaria, plague, typhus, smallpox, etc.—the difference lies more in the stage of social and sanitary advancement than in climatic factors. The sole truly exotic disease in Morocco is urinary schistosomiasis which is almost entirely confined to the area south of the Atlas mountains. This distribution is, however, determined more by social factors and the concentration of people round water courses than by climate; similarly the greater prevalence of tuberculosis, diphtheria and poliomyelitis to the north of the Atlas mountains is due to the greater urbanization of the area and not to meteorological factors.

Several diseases have a marked seasonal curve of incidence. That of malaria is understood. Measles, whooping cough and influenza occur primarily in the winter and spring. Diphtheria, typhoid, salmonellosis and dysenteries occur chiefly in the autumn, while tetanus has a peculiar distribution in the relatively humid and sunless months at the beginning of the spring. The reasons for this distribution are not properly understood but so far as they are known climate acts by indirect means rather than by an effect on man or the parasite. Dry weather predisposes to ocular infections through irritation by dust. Floods may determine the malaria season by washing out the breeding places. Intestinal diseases increase at the beginning of the rains as a result of the washing of infective matter

from the ground into water supplies. The subject is, however, inadequately understood and direct climatic influence cannot be excluded.

G. Macdonald

ASPREY, G. F. & THORNTON, Phyllis. **Medicinal Plants of Jamaica. Part I.** *West Indian Med. J.* 1953, Dec., v. 2, No. 4, 233-52. **Part II.** *Ibid.*, 1954, Mar., v. 3, No. 1, 17-41. [28 refs.]

LARRIBAUD, J. Deux cas d'empoisonnement par le " chardon à glu " *Atractylis gummifera* L. observés à Dellys (Alger). [Two Cases of Poisoning by Spindle Wort (*Atractylis gummifera*) seen at Dellys, Algiers] *Arch. Inst. Pasteur d'Algérie*. 1954, Mar., v. 32, No. 1, 23-9. [12 refs.]

TANGE, Y. Beitrag zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen, nebst Bemerkungen über dessen Giftigkeit. III. Über den Giftapparat bei *Apistus evolans* JORDAN et STARKS. [Studies on Morphology of the Poison Apparatus of Japanese Fish, with Observations on Toxicity. III. Poison Apparatus of *Apistus evolans*] *Yokohama Med. Bull.* 1953, Oct., v. 4, No. 5, 318-24, 3 figs.

_____. Beitrag zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen, nebst Bemerkungen über dessen Giftigkeit. IV. Über den Giftapparat bei *Minous adamsii* Richardson. [Studies on Morphology of the Poison Apparatus of Japanese Fish, with Observations on Toxicity. IV. Poison Apparatus of *Minous adamsii*] *Yokohama Med. Bull.* 1953, Dec., v. 4, No. 6, 374-80, 4 figs.

REPORTS AND SURVEYS

UNITED NATIONS. **Special Study on Social Conditions in Non-Self-Governing Territories.** Summaries and Analyses of Information transmitted to the Secretary-General during 1952. pp. v + 270. 1953. New York. [\$2.00; 15s.; Sw.fr. 8.-.]

This volume contains information on general social conditions, policies, race relations, urban welfare, housing problems of workers, family and child welfare benefits, peasant settlement, standards of living, and public health. This last section is the longest, comprising pp. 184-270 of the report. It is an informative statement of vital statistics (where these have been collected), nutrition, disease problems (in some detail), environmental sanitation, medical personnel, medical facilities, epidemic diseases, medical research, and public health administration.

This is a useful publication. It gives, for instance, short accounts of the various semi-official organizations developed in the Belgian Congo, such as FOREAMI, FOMULAC, CEMUBAC, etc., which are so important in that country; of the research organizations in French territories, and in territories under United Kingdom administration; and also of the administrative structure of

the medical services of the countries concerned. In the section on diseases there are short essays on epidemiology and prevalence which would be useful to administrators.

References to relevant published work are shown in footnotes, but in the medical section there are only 155 such references, which indicates that only the more comprehensive books and papers have been cited. But the references are valuable, and indeed the whole section on health is a useful conspectus.

Charles Wilcocks

COLONIAL OFFICE. Annual Report on the East Africa High Commission 1952. Colonial No. 297. 79 pp., 8 figs. on 4 pls. & 1 map. 1953.
London: H.M. Stationery Office. [3s.]

The High Commission, which consists of the Governors of Kenya, Tanganyika and Uganda, controls many activities, including activities relating to finance, social services, legislation, communications, research and scientific services, economic services, and defence. Those branches connected with health include the Tsetse and Trypanosomiasis Research and Reclamation Organization (EATTRRO), the East African Bureau of Research in Medicine and Hygiene, the Filariasis Research Unit, the East African Medical Survey, the Virus Research Institute, the East African Malaria Unit, and the East African Inter-territorial Leprosy Specialist organization. The annual reports of these units are regularly abstracted in this *Bulletin*, and need no detailed summary here, but the present report does give, in brief, an account of the work done by the staff of these units, and the chief observations made, and there is a distinct advantage in having these published together. Summaries of much of the work appear in the reports of the Colonial Medical Research Committee, which also are reviewed in this *Bulletin*.

Charles Wilcocks

EAST AFRICA HIGH COMMISSION. A Survey of Research and Scientific Services in East Africa, 1947-1956 [WORTHINGTON, E. B.]. Paper No. 6. 79 pp. [? 1953.] Nairobi: P.O. Box 601.

This is a most informative and useful statement of the inter-territorial research and scientific organizations in East Africa, particularly of those which are responsible to the East Africa High Commission. The Foreword is dated December 1951, with a postscript dated December 1952 in which the author remarks that the statements made in the Survey should be regarded as applying up to the end of 1951.

The first section, of 4 pages, is an essay on science and development in which the importance of science is very properly stressed. The second section is history and the third a short account of regional organization of science, with a table of broad groups, the number of professional persons employed in each, and the expenditure estimated for 1952. The broad groups include meteorology, agriculture and forestry, animal health, tsetse flies and trypanosomiasis, locusts, insecticides, fisheries, industrial research, health and medicine, sociology, and statistics.

Sections follow on the relation between regional and territorial science, on councils, committees and conferences, on the relations to the Colonial Office and to science in the United Kingdom, relations to other regions of Africa, and the assistance received from the United States.

In the section on the subjects there is a comprehensive table in which for each subject the services, the authority administering them, and the sources

of finance are shown. Readers of this *Bulletin* would probably be interested in these details as they affect services related to medicine, and the following is an extract from that table :—

<i>Subjects</i>	<i>Services</i>	<i>Authority administering</i>	<i>Sources of finance</i>
Animal Health	E.A.V.R.O.	E.A.H.C.	C.D. & W. (R) and territorial funds
	Territorial Depts. of Veterinary Services	Territorial governments	Mostly territorial funds with some C.D. & W. (D) & (R).
Tsetse and Trypanosomiasis	E.A.T.T.R.R.O.	E.A.H.C.	C.D. & W. (R) and territorial funds
	Territorial Depts. or sections of Tsetse control	Territorial governments	Territorial funds with some C.D. & W. (D).
Insecticides	Colonial Insecticides Unit (E.A.)	Colonial Office and Tanganyika government	C.D. & W. (R)
Health and Medicine	E.A. Bureau of Research in Medicine and Hygiene	E.A.H.C.	C.D. & W. (R) and territorial funds
	E.A. Medical Survey	E.A.H.C.	C.D. & W. (R)
	Filariasis Research Unit	E.A.H.C.	C.D. & W. (R)
	E.A. Virus Research Institute	E.A.H.C.	C.D. & W. (R) and territorial funds
	E.A. Malaria Unit	E.A.H.C.	C.D. & W. (R) and territorial funds
	E.A. Leprosy Specialist	E.A.H.C.	Territorial funds and BELRA
	Other schemes proposed	Proposed E.A.H.C.	Proposed C.D. & W. (R) and territorial funds
	Territorial Depts. of Medical Services	Territorial governments	Territorial funds
Sociology	E.A. Institute of Social Research	Colonial Office and Makerere Council	C.D. & W. (R)
	Territorial Unit in Tanganyika	Tanganyika government	Tanganyika territorial funds

Abbreviations used in above table

C.D. & W. (D)	= Colonial Development & Welfare (Development Funds)
C.D. & W. (R)	= Colonial Development & Welfare (Research Funds)
E.A.H.C.	= East Africa High Commission
E.A.V.R.O.	= East African Veterinary Research Organization
E.A.T.T.R.R.O.	= East African Tsetse and Trypanosomiasis Research and Reclamation Organization
BELRA	= British Empire Leprosy Relief Association.

The succeeding sections amplify the information on these services, giving accounts of the development of the services and details of the organizations and institutions concerned, and the Survey ends with a forecast for the future and a summary estimate of expenditure and professional staff in the various services in 1956.

Health and Medicine, and the related subjects (Animal Health, Tsetse Flies and Trypanosomiasis, Insecticides, Sociology) occupy much of this report, and the extent of their activities may partly be assessed by the amounts appearing in the estimates of recurrent expenditure for 1952—Animal Health £44,122; Tsetse Flies and Trypanosomiasis £119,172; Insecticides £35,500; Health and Medicine £101,726; Sociology £18,500. The total expenditure for the same year on all services was £752,860.

Inter-territorial research in health and medicine is arranged somewhat differently from research in the other subjects in that it comprises several independent units or institutes, each separately responsible to the Administrator of the High Commission, with the East African Bureau of Research in Medicine and Hygiene as the co-ordinating agency. These units include the East African Medical Survey, based on Mwanza, Tanganyika, and supervising the unit for filariasis research in addition to the survey itself; the East African Virus Research Institute, Entebbe, Uganda; the East African Malaria Unit, Amani, Tanganyika; and the Leprosy Unit. The scientific work of several of these units is supervised by the Colonial Medical Research Committee in London, though the administrative responsibility rests with the High Commission.

It is important, of course, to remember that the medical departments of the different territories themselves conduct important research work, especially on the insect-borne diseases, and instances of this are given in the present report. Nevertheless, this comprehensive and far-reaching organization for research under the High Commission is doing, and has every prospect of continuing to do, work of the greatest importance. In his essay on science and development Dr. Worthington makes the point that in the past a great deal of development has taken place in the wrong way because of insufficient knowledge, and that in Africa, as in many other countries, the planning of research has generally been 5 or 10 years behind, rather than ahead of, practical needs. The present organization should do much to correct this tendency. It would not be possible to summarize satisfactorily the work of the various institutions and units mentioned briefly in this most useful report, and much of the information gained has already been abstracted in this *Bulletin*. Some of the work is fundamental to a proper understanding of the problems involved, some is *ad hoc* to questions of immediate importance. Dr. Worthington has provided a valuable, and stimulating, account of a service which reflects credit on British administration.

Charles Wilcocks

AFRIQUE OCCIDENTALE FRANÇAISE. Rapport sur le fonctionnement technique de l'Institut Pasteur de l'Afrique Occidentale Française en 1952 [DURIEUX, C.]. [Technical Report of the Pasteur Institute in French West Africa in 1952] 110 pp. 1954. Dakar: Grande Imprimerie Africaine.

This report records an increase in many of the activities of the Institute compared with 1951 [this *Bulletin*, 1953, v. 50, 660]. Thus, preparation of biological products increased to 10,444,934 doses or cc., yellow fever inoculations amounted to 5,306,835, and laboratory examinations to 45,144. BCG vaccination of schoolchildren, however, fell to 23,739.

There were no epidemics in Dakar and its neighbourhood and in general the results of laboratory investigations suggested that the health of the population remained satisfactory.

Random sampling of different populations, with the aim of assessing the effects of yellow fever inoculation during the previous years, showed that the immunity achieved had reached the high average level of 90 per cent. There was, however, a fatal case of yellow fever in a European in French Guinea near the borders of Senegal and Portuguese Guinea, where the disease had not been recorded in man for some 10 years. In view of the high degree of immunity recorded above, it is evident that the persistence of the virus in this area is due to a non-human cycle which it is important to discover.

Comparative studies on different methods of testing with tuberculin in Africans showed that the intradermal reaction with adrenalized tuberculin was the most satisfactory. It is simple, applicable to all ages and readily interpreted and it is suggested that it should be standardized in French West Africa, so that results in different territories would be comparable and conclusions drawn from them consistent.

In the pathological department, Dr. CAMAIN and his colleagues continued their work on primary cancer of the liver and on schistosomiasis and studied the pancreatic lesions in kwashiorkor and the presence of liver cells with vacuolated nuclei in tropical cirrhosis. Many of the results emerging from these investigations have already been published and noted in this *Bulletin*.

Rabies statistics during the year previous to the report show that 18 Europeans and 24 Africans received anti-rabic treatment in the Institute and 192 and 703 in outstations. Among the former group, there were no paralytic accidents and no deaths. Among those treated in outstations there were 2 paralytic accidents and these are described at length. Both were in Europeans in the Ivory Coast, a woman of 22 and a child of 5, respectively. There were also 2 deaths from rabies. One was in a young European woman in the Ivory Coast who was bitten by a dog in attempting to protect her child whom the dog had attacked. Both received anti-rabies treatment, but the mother died. The second death occurred in an African of 41 in Guinea, who had not been vaccinated.

The sections on BCG and yellow fever contain the usual full information, including in the latter case details of the survey referred to above. The other sections follow the usual lines and these include a number of special investigations, some of them already published and noted in this *Bulletin*. There were 25 publications altogether by members of the staff.

H. J. O'D. Burke-Gaffney

POLUNIN, I. **The Medical Natural History of Malayan Aborigines.** *Med. J. Malaya.* 1953, Sept. & Dec., v. 8, Nos. 1 & 2, 55-114; 114A-174, 28 figs., 14 charts & 4 maps. [Numerous refs.]

In many remote and inaccessible parts of Malaya live small, isolated communities of aborigines whose way of life has been little changed by contact with Western influence. Little was known of their health status or their diseases and, at least until they were uprooted in the recent emergency, most of them were outside the reach of any medical aid except that of their animistic magicians. They are thought to number about 100,000 though only 35,000 were counted in the 1947 census. During 1950-51 Dr. Polunin devoted 15 months to the study of aboriginal communities and has revisited them on many subsequent occasions. The present comprehensive report embodies all his observations on anthropology, physiology,

economy, diet and health, together with a review of the scanty information available in previous publications. Dr. Polunin's work was done in conditions of more than usual difficulty as the inaccessible forest areas occupied by the aboriginal tribes were the main theatres of activity of armed terrorists.

Four groups of aborigines were selected for intensive study: in each case a whole community, not less than 150 strong, was examined. Groups I and II were *Semai-senoi* of central Malaya, living at altitudes below 600 ft. and above 2,500 ft. above sea-level, respectively. These folk practise a simple shifting agriculture and collect very varied jungle produce for food and barter. Their diet is likely to be qualitatively adequate though it may periodically be insufficient in quantity. Group III were *Lanoh Negritos* from 3 settlements in Upper Perak and Group IV were *Orang selatar* living among the mangrove-fringed estuaries of the Straits of Johore. The latter live in pile-dwellings and boats, catch and eat much sea food but sometimes work as labourers in exchange for rice.

Each of more than 600 persons was subjected to thorough clinical, haematological and parasitological examination and was weighed and measured. The results form a large volume of carefully standardized and analysed data for details of which the reader is referred to the original monograph. The following points are selected for inclusion in an abstract as they seem to be of particular or general interest, but they represent only a fraction of the information available.

Malayan aborigines are small in stature, adults averaging 61 inches (155 cm.) for males and 57 inches (145 cm.) for females. Weights, by American standards, are relatively even lower than heights and clinically assessed loss of weight is common. [No mention is made of the time of year at which the examinations were made or of any re-weighings: perhaps seasonal variation is negligible. No weights and heights of children are given.]

The blood-group pattern of the *Senoi* is of Mongoloid type, with an extremely low A and high B frequency, and *cDe* the only common rhesus gene-combination. Among Negritos A is commoner than B. But extreme variation of gene-frequency was found between neighbouring and similar communities. No case of sickle-cell trait was found.

Apart from weight loss, relatively few signs of nutritional ill-health were seen. Lesions of mucocutaneous junctions, possibly attributable to riboflavin deficiency, occurred in about 10 per cent. of *Senoi*. Parotid enlargement, possibly of nutritional origin, was extremely common. The high incidence of endemic goitre in all land-dwelling aborigines has already been reported (Polunin, I., *Med. J. Malaya*, 1951, v. 5, 302).

The low-level *Semai-senoi* carry a heavy burden of parasites. The incidence of splenomegaly, hepatomegaly and malarial parasitaemia and of hookworm infections was found to be far higher in Group I than in other groups, which is a possible cause of the generally poorer health, higher child-mortality rate and smaller stature of these people. Yaws is also much more common in the low-level *Semai-senoi*. Filariasis (*Wuchereria malayi*) is endemic in some aboriginal groups. Mean haemoglobin levels are very low, about 10 gm. per 100 ml. for Groups I-III.

Apart from the conditions already mentioned, the disease pattern of the aborigines differs considerably from that of urban Malaya. Some aboriginal communities seem to be free of infection by syphilis, gonorrhoea, round-worm and scabies. Among the 662 persons examined, no case of acquired heart disease, hypertension or neoplasm was found. On the other hand, tinea imbricata is virtually limited to aborigines, chest infections are very

common, and epidemics of smallpox, measles, influenza and dysentery have caused enormously high mortalities.

For many years a decline in the population of Malayan aborigines has accompanied a slow decay of their language, custom and material culture. During the recent emergency many thousands of them have been resettled to prevent their massacre by the terrorists. It was hoped that this resettlement might provide a golden opportunity to help the aborigines to raise their standards and merge with a more developed civilization. But unfortunately their decline has been accelerated by resettlement: their health has deteriorated and mortality rates have increased alarmingly. The aborigines are gentle, unaggressive people, but improvident, lazy and unadaptable. Their abnormally high death rate after resettlement can mainly be attributed to this lack of adaptability, to the difficulty of helping them without destroying their incentive to help themselves and to the worsening of economic conditions that has usually followed resettlement.

Dean A. Smith

GASPARINI, P. G. Appunti nosologici sull'Arabia Orientale. [Nosological Notes on Eastern Arabia] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1954, Feb., v. 35, No. 2, 85-103. English summary.

The eastern part of the Arabian peninsula has been described as "an oil lake covered with ground", and the author of this paper has been practising in the Province of Al Hasa, a part of Saudi Arabia which extends along the Persian Gulf. The area now employs several thousands of Italians who work either in the oil industry or at the U.S. Air Base of Dhahran. There are also many American technicians with their families. There are Health Centres at Dhahran, Kuwait and the Bahrain Islands.

The author deplores the present lack of sanitary control at the ports, especially of pilgrims, and the fact that much of the American health provisions is confined to the stations; disease is not followed up into the villages and in the homes of the Arab workers employed.

The paper deals at some length with the various skin diseases and refers to a wide variety of other conditions which the author has seen among the European and American subjects. He mentions the frequency of urinary calculus and attributes this to the high salinity of the water supplies; he gives the chemical analysis of various local sources and compares the saline composition with that of water supplies in Milan, Naples and Rome. He points out that the water supply at Al Azizijah, where the largest Italian community of workers is to be found, contains 13 times the amount of sodium chloride of the subsoil water in Milan.

The author states that Italian experience in the medical and public health fields could be of great help to the local administration and considers that health surveys should be undertaken in this rapidly developing area.

J. Cauchi

FUHRMANN, G. Das Gesundheitswesen in El Salvador. [Health Conditions in El Salvador] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Apr., v. 5, No. 2, 238-54, 5 figs.

This is a comprehensive review of the demography of El Salvador, one of the smaller of the South American States, with Honduras to the north-east, Guatemala to the west and the Pacific on the south. In 1952 the population was about 2 million spread over an area of 21,160 sq. km. The climate is tropical and maritime; the day temperature varies between 30°C. on the coast and 12°C. in the hilly districts; the highest temperature in

the coastal region is 35° in March and April; the dry season is between November and April and the rainy (winter) season May–October. The occupation of the inhabitants is mainly agricultural, only 120,000 or so being engaged in commercial and in industrial projects. Nutrition is not too good; the average basic ration consists of 460 gm. cereal, almost exclusively maize, 120 gm. legumes and 100 gm. sugar (molasses)—total calories 1,800–2,000, nearly all of it carbohydrate; fruits are fairly plentiful—oranges, bananas, pawpaw, pine-apple, mangoes—but of little caloric value. Meat is eaten only at festival times and milk drunk only in the large towns, and its price is high.

Vital Statistics. In 1951, births totalled 93,634 and deaths 29,030, of which 7,172 (24·7 per cent.) were in the first year of life; a birth-rate of 48·7 per mille and a death-rate of 15·1, and an infant death-rate of 76·6 per 1,000 births. In round figures, 25 per cent. of deaths occurred in the 1st year of life, 24 per cent. in the 1–5-year group, 30 per cent. in the 4–45-year group, and 21 per cent. over 45 years. The register of causes of death is very incomplete; 6,784 are returned as "unknown" and many, if not most, of the others are merely retrospective diagnoses by doctors who have no personal knowledge of the patients.

Health measures are defective. Doctors, dentists and nurses are deplorably few. There are only about 330 doctors in the country, of whom 250 are in practice, the rest are engaged in administration or have retired. There are 184 in the chief towns, about 1 per 1,000 inhabitants. Of 1 million people living in the suburbs of the chief towns only one-third have access to hospitals, two-thirds have not, owing to transport difficulties. In 5 towns, with a population of about 470,000, there are only 904 hospital beds available. In general terms, there are 4·4 beds for 1,000 of the population, 3,038 beds altogether; in addition there are 300 beds for tuberculosis patients, 300 psychiatric and 129 beds in private clinics in the capital. There are 22 general hospitals, with medical, surgical and gynaecological sections; only a few have special children's wards. In the chief town there is the Benjamin Bloom Hospital with 125 beds for children. The Rosales Hospital, with 1,350 beds, is up to date with X-ray, pathology, clinical chemistry, bacteriology, serology and haematology departments and laboratories. Hospital wards generally are overcrowded and dirty; medical and surgical patients are not separated and children and adults are accommodated in the same wards.

In addition to the 22 general hospitals there are 9 "Urgency Clinics" in different parts of the country and medical students, having passed their examinations, spend 6–12 months at these clinics. The staff of the clinic comprises one doctor, one dentist and a nurse qualified in midwifery, and a servant. There are only some 700 nurses in the whole country. The article contains a plan of the Health Department. There are special sections dealing with malaria, with control of infectious intestinal diseases, with child hygiene and inoculations against whooping cough, diphtheria and smallpox, with tuberculosis and venereal diseases. Special attention is also given to nutrition, housing, school hygiene and industrial hygiene.

H. Harold Scott

MÜLLER, W. Ärztlische Arbeit an der Miskito-Küste (Nicaragua). [The Work of Medical Men on the Miskito Coast, Nicaragua] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Apr., v. 5, No. 2, 255–69.

The Miskito land had nothing to do with the prevalence of mosquitoes or other insects there, although the name is often designated erroneously

the Mosquito Coast. The Miskitos are a race living with the Ramas and the Sumus; they have a brownish skin, and an oriental or Baltic type of face. They live largely on rice and beans and fruit—bananas, plantains, oranges, mango, guava, avocado, pawpaw and bread-fruit. Citrus is taken sparsely because of its acidity; sugar-cane is given to the children and is thought to be injurious to their teeth. Cassava and yam are eaten, and coconut, the fat of the last being considered a prophylactic against amoebiasis. Meat is very rarely eaten; the cattle are thin and give very little milk and, though swine are plentiful, they are thin and ill-nourished; turtles, crayfish and crabs are caught on the coast.

The early pages of this article are taken up with telling what diseases are not, or are very rarely, met with, *viz.* high blood pressure, gastric ulcer, asthma, measles, chickenpox and whooping cough. Pneumonia is not uncommon, is atypical in form and resistant to penicillin, but reacting to aureomycin. The type has not been determined as there are no laboratories for pathological investigations. Tuberculosis is far from rare and is called locally "pusa sickness". Syphilis is widespread and congenital syphilis is seen in infants and evidences of it in adolescents and adults, as keratitis and deafness; *ulcus molle* and lymphogranuloma are also seen. The Miskito bathes frequently, so skin disease is rare. As regards surgical conditions fractures and machete wounds are fairly common, goitre is seen; haemorrhoids and other varices are also rare; carcinoma is occasionally met with but "in inoperable stages"; many instances of otitis media are seen.

The chief tropical diseases are malaria, ankylostomiasis, amoebiasis, pinta (locally *bulpis*) and yaws. Helminthic infections fairly common in other parts of South America, such as *Wuchereria bancrofti*, *Onchocerca volvulus*, *Dipetalonema ozzardi*, *Schistosoma mansoni*, were not seen. Amoebiasis is found in all classes of the population; Balarsen, an arsenical allied to BAL, gives good results in treatment, "curing in 5 days" [dosage not stated].

Malaria is generally of the subtropical type and is called by the Miskitos "kaula sickness" or "cold sickness". Daraprim [pyrimethamine] chloroquine and primaquine are used in treatment [again no dosage is mentioned]; DDT has proved of little use as an insecticide. Leishmaniasis and trypanosomiasis seem to be absent, at least they have not been seen by the author, nor has any case of Chagas's disease. Three cases of leprosy are referred to, all of the tuberculoid form. He has not seen any cases of yellow fever in man, though he came across 2 suspicious cases, but monkeys have become practically extinct, whether from disease or because they have wandered elsewhere owing to destruction of the bananas by a hurricane is not certain. [This would be a good opportunity of testing for yellow fever by viscerotomy specimens.] Snake-bites are due chiefly to the Coral snake, *Micrurus nigrocinctus*, or the Fer-de-lance, *Bothrops atrox*, and occasionally *Lachesis muta*. Avitaminoses are mentioned, but only to add that the author has not come across any cases. Ariboflavinosis and pterygium are more common, as is the Plummer-Vinson syndrome. Rickets among the children is far from uncommon. This general survey has been made by a Mission Hospital doctor. [In the absence of a laboratory little can be done to elucidate rarer conditions or instigate research and the article consists largely of the mention of diseases common in the tropics, but in nearly every instance the author adds that he has not met with any cases.]

H. Harold Scott

BOOK REVIEWS**FAUST, E. C., Amebiasis.**

This book is reviewed on p. 919.

PATWARDHAN, V. N. **Nutrition in India.** pp. vi + 345, frontispiece & 27 figs. (10 on 10 pls.) 1952. Bombay: Hind Kitabs Ltd., 261-263, Hornby Road. [Rs. 15-8; 27s. 6d.]

The introduction to this book is a brief account of the progress of nutritional research in India. An account is then given of the principal foods grown and the ways in which they are used; there are chapters on proteins, fats and other constituents of the foods, on diets and dietary surveys and on such related matters as basal metabolism and the composition of the blood, and a long section—taking nearly one-third of the total number of pages—on diseases which arise from faulty nutrition.

The scope is wide and Dr. Patwardhan is to be congratulated on the breadth of his vision. He has been able to quote from the published work of a large number of Indian investigators but, as he clearly implies by the strength of his criticism, the work is of uneven quality and much of it needs repetition. The need is one more tragedy of a desperate situation: if there is to be adequate nutrition of the innumerable Indian population, new and daring schemes have to be brought into operation. The research that must precede and inform those schemes must be of the highest quality.

Much research in nutrition is on a comparative basis. Up to the present time, the nutrition of a few groups of human beings, mostly in Europe and the United States, has been compared with that of a few animals, but it becomes every day more obvious that much will be learnt by comparing the nutritional habits of different peoples. Dr. Patwardhan's book may therefore be considered to be of particular value as one of the primers that may eventually make the human comparisons possible, and it seems legitimate to point to some of its unique statements. India is said to have the largest cattle population in the world, with the lowest milk yield; the cows and the she-buffaloes produce less than 6 oz. per day for each member of the population and, in contrast to what has been achieved elsewhere, there are no signs of recent improvement in the yield. No more than one-third of the total production is used fresh, and the quality of the fresh milk is undoubtedly poor. The position is only partly retrieved by the use of milk products. The ghee is adulterated, and so are the vegetable oils that could take its place. In regard to food, it is said that the "laws are quite inadequate and business morality has reached a new low standard". The cultivation of rice and the various methods used in its preparation, including the important parboiling, are described in detail, but it is pointed out that "no attempt has been made to breed and propagate the nutritionally preferable varieties". It is interesting that Dr. Patwardhan, after reviewing the possibility of using soya, gives his opinion that it is unlikely to play an important part in improving the nutrition of the Indian people, and that several pulses grown in India may be of greater value. Indian reports of the use of soya have often been unfavourable, but there is no doubt that acceptable foods can be made from soya, as they can be made from many pulses, and Dr. Patwardhan will undoubtedly be willing to revise his opinion if the evidence is sufficiently strong. He is able to summarize the results of over 130 dietary surveys carried out on low income groups; the results show average daily intakes of 2,560 calories for each consumption unit with 292

calories (73 gm.) from protein. These figures, which seem rather high to the present reviewer, are advanced cautiously by Dr. Patwardhan, who is unwilling also to accept without reservation the results of 40 of the surveys that show about one-eleventh of the total protein to be of animal origin. The true proportion is undoubtedly much smaller.

Underlying many of the discussions is the necessity for some fundamental physiological knowledge of a special character. For instance, reference is made to balance studies that have shown, in India as in other tropical countries, long-continued nitrogen retentions in adults that are in fact impossible. The most likely explanation, as Dr. Patwardhan says, is that the losses through the skin, and the needs of "adult growth" have been grossly underestimated, but this point, like so many others, has not been thoroughly investigated in a tropical population. The growth of children in relation to their state of nutrition is another subject on which little has been done, and it seems to have been imperfectly understood in India that standards obtained in other countries, and the indices derived from those standards, have limited application outside their countries of origin. Skeletal growth has hardly been studied at all, and the available data—showing earlier fusion of some epiphyses than in European children, although eruption of teeth is not delayed—certainly need confirmation.

The book is fascinating by virtue of the problems it poses, and their diversity. It is a pity that the author has been unable to devote more space to the possibilities of solving the basic problem: that of finding good food for a huge and increasing population, divided into many groups, each with its nutrition determined by religion and superstition in addition to necessity and habit. Perhaps there is no solution except birth control, more effective than the periodic famines and the uncontrollable diseases of former times. There is obvious need for a plan of construction that would be widely acceptable: it might be usefully preceded by a coordination of nutritional research that also seems to be badly needed. It is to be hoped that Dr. Patwardhan and his colleagues are already at work on such a plan, and that they will have in mind the value of concentration on the children and the other groups that are most susceptible to nutritional disease. They could benefit not only India but also the large Indian populations now residing outside India, and eventually all the undernourished peoples of the tropics.

R. F. A. Dean

LOGAN, John A., with the collaboration of Thomas H. G. AITKEN, Guido U. CASINI, Frederick W. KNIPE, John MAIER & Athol J. PATTERSON. **The Sardinian Project. An Experiment in the Eradication of an Indigenous Malarious Vector.** pp. xxix + 415, coloured frontispiece, 1 folding map, 37 text figs. & 76 figs. on 56 pls. 1953. [Amer. J. Hyg. Monographic Series No. 20.] Baltimore: Johns Hopkins Press. London: Geoffrey Cumberlege, Oxford University Press, Amen House, Warwick Square, E.C.4. [\$7.50; 60s.]

This is the story of a great enterprise. In October 1945 the Rockefeller Foundation agreed to cooperate in an all out attempt to eradicate *Anopheles* mosquitoes from Sardinia—to determine whether or not the species eradication technique is applicable to the problem of malaria control in the Mediterranean region. Other partners in the enterprise were the Italian Government and UNRRA. Local administrations in Sardinia and Economic Cooperation Administration [ECA] also cooperated. The work was entrusted to a special agency, under the Italian High Commissioner for

Hygiene and Public Health, which came to be known as ERLAAS (*Ente Regionale per la Lotta Anti-Anofelica in Sardegna*). The first Director of ERLAAS was D. Bruce WILSON; he was succeeded in 1946 by J. A. KERR. In 1947 J. A. LOGAN assumed the direction and remained in charge till the end of the experiment in 1950.

A preliminary anopheline survey of the island revealed the presence of *Anopheles maculipennis labranchiae*, *A. claviger*, *A. algeriensis*, *A. maculipennis melanoon* and *A. marteri*. *A. m. labranchiae* was much the most prevalent, aggregating 88 per cent. of all collections, and was the all-important vector of malaria. There was no anopheline breeding in brackish water. *A. m. labranchiae* was found at all elevations up to 1,000 metres above sea level and was often found at very considerable distances from any human habitation. It would seem that a large proportion of the *A. m. labranchiae* population fed on domestic animals, and some had become sylvatic, being found where neither human beings nor domestic animals were available for food. Thus it early became apparent that eradication of the species could not be achieved by residual spraying alone, however useful that measure might prove in reducing malaria prevalence. Chief reliance would have to be placed on larvicidal measures. The magnitude of such a task is apparent to all who have visited Sardinia and to all who read the admirable account of the terrain contained in this book. No collection of fresh water could be overlooked, and many are all but inaccessible, and many overgrown. The almost heroic efforts that were made, the difficulties that were encountered, the mistakes that were rectified and the revisions of the programme necessitated by unforeseen circumstances are described in detail. When the enterprise was brought to an end in 1950 *A. m. labranchiae* had not been eliminated but its prevalence had been restricted to a few persistent foci.

Though the main objective had not been attained there remained enough on the credit side of the account to justify so large an expenditure of money and energy. Malaria had all but disappeared. The mean number of recorded malaria cases in Sardinia for the years 1936–38 was 36,655 (350 per 10,000). In 1946 there were 75,447, of which 10,149 were new cases. In 1950 only 44 cases were recorded, of which only 4 were fresh infections. In 1951, up to October 1st (the peak of malaria transmission is July to September), there had been only 9 cases of which 6 were relapses.

Much fertile land has been reclaimed for agriculture. The work of ERLAAS may well mark the beginning of an era of prosperity such as Sardinia has never experienced in the past.

The book should be of very great value to all who are interested in large scale malaria control or eradication schemes. *Norman White*

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